About the User's Manual

The User's Manual serves for operating this instrument only. Our company shall not be responsible for any consequences and liabilities caused by using this user's manual for other purposes.

The User's Manual containing special information is under copyright protection. All rights reserved. Copy, duplication or translation of the whole or any part of the User's Manual is prohibited in case of no prior written consent from our company.

Based on the need of product technical improvement or the file updates, we reserve the right to modify the contents contained in this manual; if the changes do not involve safety issues, the contents are subject to amend without notification

Due to technical upgrade or special requirements from users and with the precondition that the performance of the instrument will not be lowered, some components may vary from the description of configuration in the User's Manual.

The explain for tagging in this manual

⚠ **Warning :** You should know the information for how to avoid the animals and medical staff may suffer injury.

Note: You should know the information for how to avoid possible damage to equipment.

Explain: The important information you should known.

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CE 0123

The CE mark is a protected conformity mark of European Community.
The products herewith comply with the requirements of the Medical Device Directive 93/42/EEC

EC REP

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Content

Foreword

Thank you for choosing the digital electrocardiograph series products produced by the company. In order to ensure the safety of you, the animal and the product, please carefully read this manual before using, which can provide you with a series of safety reminders and application guidance, helping you successfully reach the expected goal during the process of usage. In this user's manual, the descriptions with the symbol ⚠ are matters needing especial attention, which may involve information about the safe usage of the product, so please pay extreme attention to those matters.

In order to provide assistance to users intuitively, the manual quoted some pictures as reference. As the product undergoes improvements continuously, the detailed information on parts of the pictures may be inconsistent with the actual situation, but these differences would not affect the normal operation and interpretation of the users, so can be ignored. At the mean time, the manual also described the expansion optional functions of the product, which can only be realized when you have purchased the product with those optional functions, so please identify it.

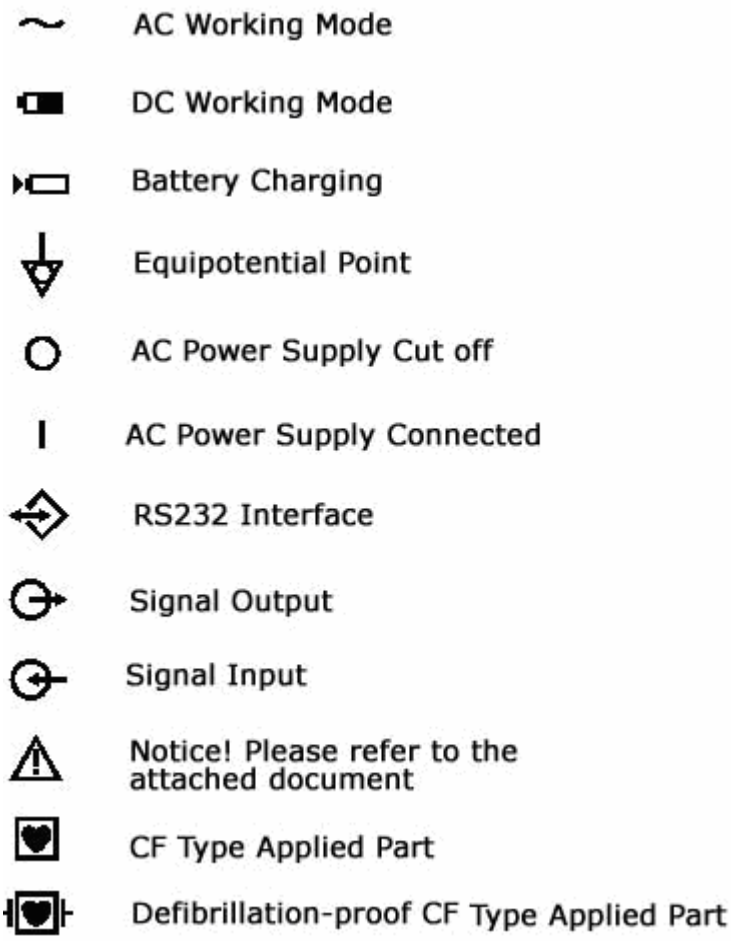
Digital electrocardiograph is used to record and display the biopotential signals generated by the activities of the heart. It mainly uses ECG electrode to extract biopotential signals from human body, which are transmitted, filtered and amplified through the lead input network, transferred into numerical information by A/D, sent into the recorder and display after digital processing, and thus the ECG waveforms can be recorded and displayed. In view of the specialization of its applications, the product can only be used by medical personnel with professional qualifications in hospitals, clinics or medical centers, as well as first aid sites. As the complexity of the physiological structure of human body and the diversity of the causes of diseases, the automatic diagnosis results given by the product are for reference only, which shall be complemented by professional doctors' comprehensive diagnosis according to the actual situation of the animal.

According to the classification principles of Medical Electrical Equipment Part I: General Requirements for Safety (IEC60601-1) the digital electrocardiograph is classified into the following category:

- Anti-shock category: category I, equipment with built-in power supply.
- Anti-shock level: CF type applied part
- Degree of protection against harmful inflow liquids: normal equipment (enclosed equipment with no protection against harmful inflow liquids.

- Degree of safety when used with mixed gas of flammable anesthetic gas with air, oxygen or nitrous oxide: the equipment cannot be used with mixed gas of flammable anesthetic gas with air, oxygen or nitrous oxide.
- Duty: continuous running equipment.

Some symbols are used to represent specific information in the manual and the nameplate, sign and mark of the product, which are listed as follows for you to recognize:



Note:

Refer to the menu of status setting for Information items and interpretations on the display screen

Chapter 1 Common Matters Needing Attention

★ **The device is for the exclusive use of licensed physicians or personnel.**

★ **Please read the following precautions thoroughly prior to using this instrument.**

★ **Applicability: It is applicable to perform the routine diagnosis via electrocardiogram for various medical therapy units, particularly in cases such as health examinations, out animal & emergency departments and wards of hospital.**

⚠ **Warning: The following measures should be taken when installing or storing the instrument:**

- Keep the instrument away from splashing water, and do not use or install it where air pressure, humidity, temperature, ventilation, air containing dust, sulfur, salt, alkaline gas and chemicals might affect it .
- Install the instrument on a stable plane, and prevent it from vibration and mechanical shock when moving it.
- Install it in a room with complete infrastructure.
- There should be no high capacity machine such as high voltage cable , X-ray &ultrasound device as well as diathermy machine around this electrocardiograph.

⚠ **Warning:**

- The power supply should be capable of providing the proper voltage and frequency as required in the instruction manual as well as sufficient capability.
- Do not install the instrument in a chemical storage area or where gas is generated.

⚠ **Warning: Prior to operation:**

- Check that the instrument is in a complete and normal condition.
- Check that the instrument is properly installed.
- Check that all cables are connected correctly and the instrument is grounded correctly.
- It should be given particular attentions when using this instrument with other devices to avoid misdiagnosis or other problems.
- All circuits that contact the animals directly should be examined closely.
- When battery used, please check the voltage and condition of battery first, charge and discharge the battery, and keep the battery fully charged.

⚠ **Warning：In operation**

- The physician should observe the animals closely without leaving during the operation. Turn

off the power supply and remove the electrodes when necessary to ensure the safety of animals.

- Prevent the animals from contacting the other parts of the instrument and other conductors except the electrodes.

⚠ **Warning: After operation:**

- Turn all functional status back to the initial status, then turn off the power supply.
- Remove the electrodes gently and do not pull the lead cable emphatically when removing the electrodes.
- Clear up the instrument and all accessories for the trouble-free operation for the next use.

⚠ **Warning:**

The maintenance and servings of this instrument should be performed by the experienced technicians. When there is any functional abnormality with this instrument, it should be clearly identified to prevent the instrument from running with fault.

⚠ **Warning:**

Do not make any modification to this instrument.

⚠ **Warning:**

Maintenance and servicing

- The instrument should be subject to the maintenance and servicing regularly (Once half a year at least)
- Since the electrocardiograph is a measurement instrument, the users should have it verified by the legal unit of measurement according to the << Verification Regulation of Electrocardiograph>>, and the verification cycle should not be longer than 1 year.
- The signal input/output ports (when needed to use) are only permitted to be connected with devices of Class I which is in compliance with the standard IEC60601-1, and the total leak current should be measured by the users to determine if it conforms with the requirement and can be used after connection.
- The electrical basic circuit and the list of parts are exclusively provided to the qualified maintenance stations and personnel confirmed by our company.

⚠ **Warning:**

Products treated after scrapped: the relevant packaging materials, depleted batteries and scrapped products are treated, please remember to follow local laws, the user dispose properly of the scrapped products and materials on the basis of the requirements of local laws, and to support them recovery separation work.

The use of rechargeable batteries:

⚠ **Warning:**

Improper operation may cause the battery becomes hot, fire, explosion, destruction or attenuation of the battery capacity. The use of Rechargeable battery (hereinafter referred to as "Battery"), please read these instructions carefully and use precautions.

⚠ **Warning**:

Polarity of the batteries can not be reversed, or could cause an explosion.

⚠ **Warning**:

Do not fire near the source or the environmental temperature exceeds 60 ℃ battery, do not heat the battery or thrown it into the fire.

Taken to avoid the battery by water splashes, do not drop the battery into the water.

⚠ **Warning**:

Don’t chisel into the battery with metal chisel, hammering, or drop the battery or use the other ways to damage the battery; otherwise it will create fat cells Heat, smoke, deformation or combustion hazard.

⚠ **Warning**:

When you find the battery leakage or emit unpleasant odors, please go away immediately. If the fluid leak into the skin or clothes on, immediately wash with water. If the electrolyte leakage and enter the eyes, do not rub the eyes, immediately with a clean water and see a doctor.

⚠ **Warning**:

Only authorized installation or maintenance engineer can open the battery compartment, replace the battery; and must use the same type of rechargeable batteries which our company’s division to provide.

⚠ **Warning:**

When the battery lifetime to reach, or find the battery, smell, deformation, discoloration or distortion, you should stop using the battery, And used batteries according to local regulations for processing.

⚠ **Warning:**

You must turn off battery before plugging; otherwise it will appear black and white, hang and so on.

Note:

Taken to avoid the equipment being splashed with water.

NOTE:

In this manual, the subsequent amendments (not including the corrections) or revised editions of the dated reference documents are not applicable to this manual, and the latest versions of the reference documents not dated apply to this manual.

Maintenance Warranty

Our company guarantees the new instrument on the material and technological qualification for this product within 18 months since purchasing day, while accessories and consumables are not covered by the guarantee in principle. This guarantee is also inapplicable to the products undergoing any modification, disassembly, refitting or self-repairing without permission of our company, as well as the products damaged by accidents, fire disaster, thunder and lightning, flood and other disaster, intentional damage, improper installation and improper usage.

★ **Matters need attention on electromagnetic compatibility (EMC)**

This instrument conforms with the IEC60601-1, a safety standard for medical electronic devices or systems. However, the electromagnetic environment exceeding the limit or level defined by the standard IEC60601-1 will introduce the unwanted interference to the instrument, disable its intended functions or compromise its intended performance. Thus, if there is any discrepancy with this instrument compared to its intended functions during operation, please do not use it for longer until the adverse affect is identified and eliminated. The appropriate preventing measures are given below by this manual for such cases:

- Affect from radiated electromagnetic wave:

The use of mobile phone may affect this instrument. Do instruct all the people around to turn off their mobile phone or mini-radio devices when any medical electronic device is installed.

- Affect from shock and conductible electromagnetic wave

The high frequency noise produced by other devices can be introduced into this instrument through the alternating current socket. Please identify the noise source first, and if possible, stop the working of related devices. If they are not allowed to be stopped, measures such as application of noise abatement device should be taken to minimize the influence.

- Affect from static electricity

The static electricity in a dry environment (indoor) may affect this instrument, especially in winter. Humidifying eh indoor air or pre-discharge the static electricity on the cable and the electrocardiogram recording personnel prior to using this instrument.

- Affect from thunder and lightning

If there is thunder and lightning occurring around this instrument, a voltage shock may be caused in this instrument. If it is considered as dangerous, you can pull off the plug of power supply from the alternating current socket to run this instrument by its internal power supply.

Chapter 2 Safety Matters Needing Attention

★ **Please read this operation manual closely to learn the correct operation manners thoroughly for sagely and effectively using this instrument.**

Note:

This instrument should be installed on a smooth and stable working bench, and be prevented from the intense vibration and shock when moving it.

Note:

The frequency and voltage of the alternating current should meet the requirement, and the current capacity should be sufficient.

Note:

When the integrity of the protective wire is unsure, please use the internal DC power supply.

Note:

The applied part of circuit works in a floating ground condition, and the design conforms with the safety standard for Type CF, thus it is able to record and display the electrical signal of body surface generated by the activity of cardiac, but can not directly act on cardiac.

Note:

For the accuracy of the electrocardiogram tracing, this instrument should be installed in a quiet and comfortable environment.

Note:

Turn off the instrument immediately if there is any abnormality occurring during the operation.

⚠ **Warning:**

The power supply cable should be 3-core cable when using this instrument with the alternating current; otherwise the hazards of electric shock may be introduced to the animals and operators. When the available 3-core cable is unusable, please use the battery for power supply.

⚠ **Warning:**

The room should be equipped with the complete power supply system and grounding system, otherwise it might be harmful to the animals.

⚠ **Warning:**

When it is used in combination with the cardiac defibrillator, the contact with animal or hospital bed should be avoided. All the electrodes which are connected or unconnected to the animals as well as the animals themselves are not necessary to be grounded .All the electrodes for use should be the Ag-Cl electrodes provided by our company . The animal cable specially provided by our company should also be used for ensuring the protection against the charging of the cardiac defibrillator. It is not recommended to use this instrument in combination with the other electric stimulators. However, if necessary, they should be used in the presence of professionals and under the appropriate directions. When the instrument is used in combination with the cardiac defibrillator or the other electric stimulators (such as HF surgical units), it is recommended to use the disposable chest electrodes in the shape of plate to prevent the adhesive metal electrodes from burning the skin of animal.

⚠ **Warning:**

Be cautious when the animal is connected with more than one instrument, because the total leak current may be harmful to the animal. Only the Class I devices in compliance with the standard of IEC60601-1 are allowed to be connected to this instrument, and the total leak current should be measured by the users to determine that if it meets the requirement and can be used after connection.

⚠ **Warning:**

When the animal is connected with a cardiac peacemaker, the accuracy of ECG testing and the analysis result might be affected. In this case, it is recommended for physicians to perform the identification and analysis in combination with the waveform. However, the potential risk will be increased in this case. Thus it should be given particular attention to the safety problem when recording the ECG in this case, and the appropriate measures should be taken to ensure the leak current at a acceptable level.

⚠ **Warning:**

Keep the high frequency electric knife away from the electrodes to prevent the animals from burning. Make the electric resistance between the high frequency electric knife and animals' body as low as possible, and be cautious particularly. If necessary, the plate electrodes can be used because of its larger contact area to limit the high frequency current density into an acceptable range.

⚠	**Do not use this instrument in presence of inflammable gas such as anaesthetics , oxygen, hydrogen or in presence of inflammable chemicals, otherwise it may cause the explosion or fire disaster.**

⚠	**Do not use this instrument in the medical hyperbaric chamber, otherwise it may cause the explosion and fire disaster.**

⚠	**Especial intention:The cardiac defibrillazing &monitoring unit not exit in this instrument, you must use our company's lead lines which has the electric defibrillation function.**

Chapter 3 Features and Operating Principles

3.1 Composition of the Product:

Composition of the product: the product is mainly composed of the main machine, leads, limb electrodes and breast electrodes.

3.2 Appearance Description of the Product

- Description of the Front Structure of the Product

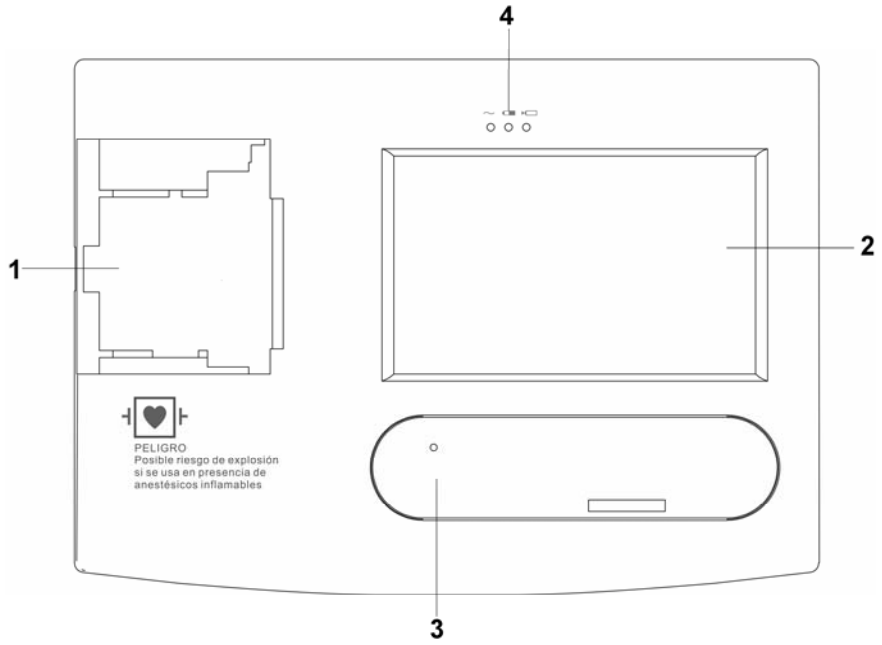


Figure 3-1 Front Structure of the Product

1. Recorder

Install record paper and realize printing and output.

2. Display

LCD part, used to display the working status (or waveforms) of the product.

3. Control Panel

The controlling area of the product, through which the operator can conduct operations and controls on the product.

4. Indicator Lamps

Indicate the working status of the product. The functions of the lamps are as follows (from left to right): AC Working Indicator Lamp, DC Working Indicator Lamp, and charging Indicator Lamp.

Note:

Do not put heavy objects on the LCD display or impact it, otherwise it may be damaged.

- Description of the Various Function Keys on the Control Panel

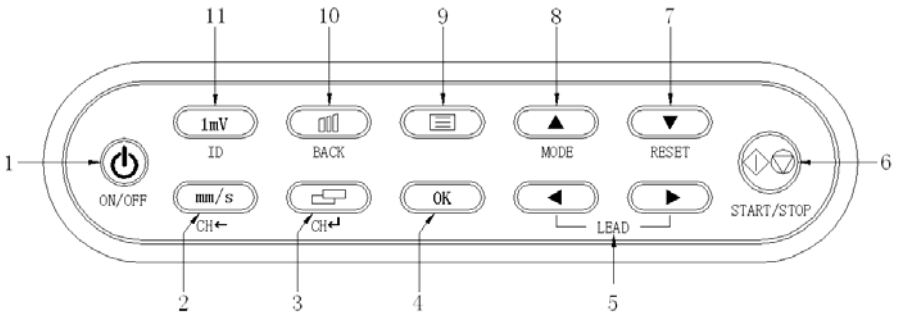


Figure 3-2 Various Function Keys on the Control Panel

1. ON/OFF Controlling Button to Turn the Machine On and Off.

Used to switch the status of the machine between On and Off. When there is any malfunction or breakdown of the system, press this button and hold it for 3 seconds, and the machine can be turned off.

2. mm/s (CH←) Recording speed control button/ character deleting button

① Change the recording speed of the recorder according to the requirements of the applications.

② In the Chinese Bopomofo input method, delete the currently input letter.

3. (CH↵) Copy button/Character confirmation button

① When the recording is finished, conduct the last time of data copying before the machine turned off.

② In the Chinese Bopomofo input method, confirm the currently input letters.

4. OK Confirm Button

Confirm the selection of the options in the menu (or enter into the next level of menu).

5. LEAD (◀/▶) Lead switching button

① In the recording status, used to switch the lead;

② In the menu setting status, used to select the parameters of setting.

6. START/STOP Recording start/stop control button

In various recording modes, used to start or stop recording.

7. RESET (▼) Closing button (▼)

① In the standby status, used to close the lead signal;

② In the menu setting status, used to select options in the menu.

8. MODE (▲) Mode switching button (▲)

① Used to switch among various recording modes;

② In the menu setting status, used to select options in the menu.

9. Menu setting button

Press this button in the standby status to enter the menu, and in the menu status to exit the menu.

10. (BACK) Sensitivity switch/return button

① Conduct sensitivity switch in the standby status;

② In the menu setting status, used to return to the upper level of menu.

11. 1mV (ID) ID button

① In the recording status, press this button to promptly print the ID sign;

② In the standby status, press this button to browse the information of the animal.

Note:

Do not use sharp objects to operate the control panel in order to prevent damaging the panel, being shocked by contacting the internal circuit or damaging the product. Do not put irrelevant objects on the control panel for a long time, because that will reduce the elasticity of the control buttons on the panel and disable the panel functions.

- Description of the Bottom Structure of the Product

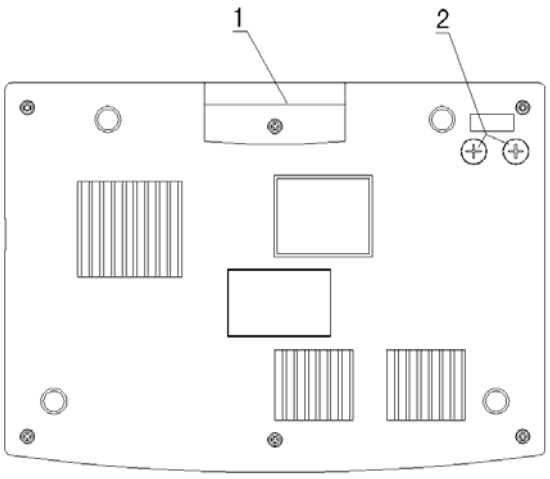


Figure3-3 Bottom Structure of the Product

1. Handle

Used to carry the product.

2. Fuse Base

With fuse inside.

- Description of the Right Structure of the Product

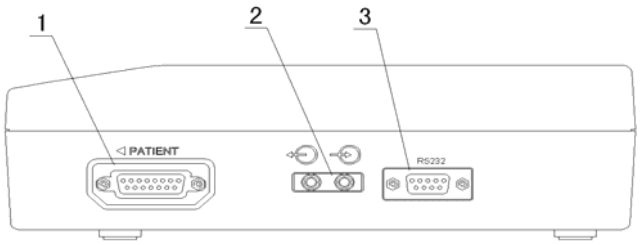


Figure3-4 Right Structure of the Product

1. Lead Input Interface

Connect to the lead.

2. Line Input/Output Interface

Line Input Interface: receives the input ECG analogue signals and conducts printing;

Line Output Interface: outputs the ECG analogue signals collected by the product.

3. RS232 Interface

The data transmitting port to conduct communications with the computer.

- Description of the Rear Structure of the Product

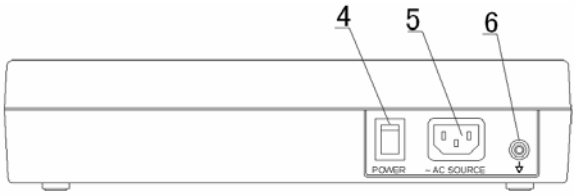


Figure3-5 Rear Structure of the Product

4. AC Power Supply Switch

Used to connect and cut off AC power supply.

5. AC Power Supply Socket

Used to connect to AC power cord.

6. Equipotential Point (grounding post)

The equipotential connecting point when the equipment is used in connection with other facilities, also the safe grounding point of the product.

3.3 Principle introduction and block diagram

1. Power supply

(1) Principle introduction about power supply

The alternating current can be transformed to be the direct current with a voltage of about 20V through the voltage transformation or the switch power transformation. Thus the internal rechargeable battery can be charged with stable voltage and limited current. At the same time, the transformed current together with the battery output can be transmitted to DC /AC switch circuit ,then transformed to be the main power supply as +5V and +24V by the switch power stabilizer, and transformed to be +3.3V、+1.8V and -5V through the power supply transformation.

The power supply with the voltage of +5V,+3.3V、+1.8V and -5V is supplied for the ground circuit. The normal current load is 750mA approximately, the designed capacity is 3A, and the current limiting reaction is at 3.75A.

+24V is for the paper driving unit and the printing head. The power supply to the paper driving unit is in a manner of width adjustment and wave chopping to enhance the efficiency of the driving unit. The normal current load is 500mA for the +24 power supply, the designed capacity is 850mA and the current limiting reaction is at 1.2A.

The power supply for the floating ground circuit is from the output of AC/DC switch circuit which is transformed by the self-excited switch power and the insulation pulse transformer. The +5V power supply for digital part in the floating ground circuit is from the direct output of switch power with invariable voltage, and the normal current load is 150mA with the designed capacity of 300mA. The +8V and -8V supplied for analogue part of the floating ground circuit is from the variable voltage output of the switch power which is transformed by the three terminal stabilizer, and the normal current load is 60mA with a designed capacity of 100mA.

(2) Block diagram for the principle of power supply (This electrical basic circuit diagram and the list of parts are exclusively provide to the qualified maintenance stations and personnel conformed by our company)

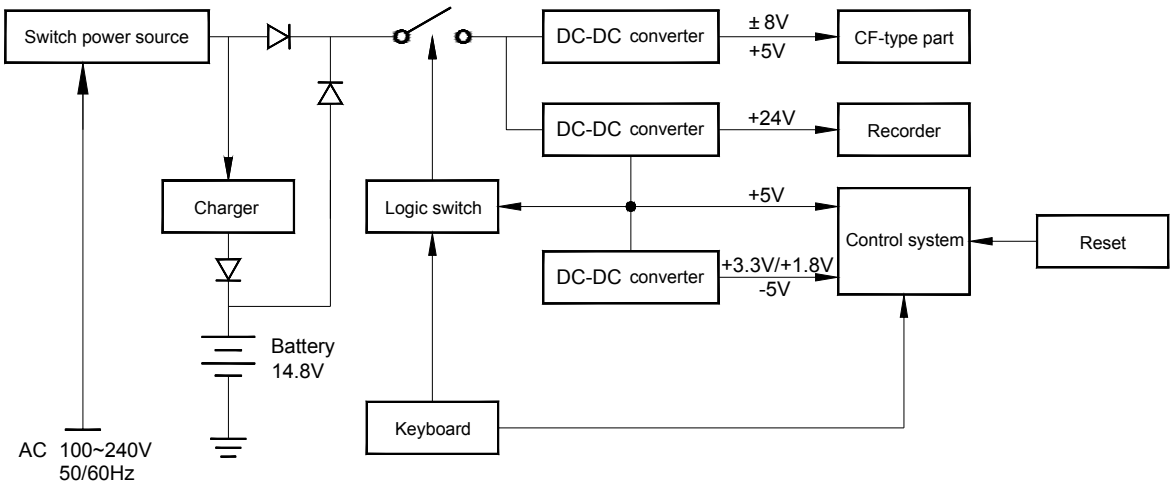


Figure3-6 Block diagram for the principle of power supply

2 Amplification

(1) Principle introduction for the amplifying unit

The floating ground circuit of the whole instrument is a signal capture system which consists of analogue circuit and A/D converting system. The analogue circuit is composed of lead signal amplifier, anti-aliasing low-pass filter, channel switch, gain controller, lead- fail detector, etc. The CPU system of the whole instrument is responsible to coordinate the various circuits such as A/D converter, channel switch, gain controller and lead-failure detector to perform the signal capturing and lead-fail detecting. The control information between the floating ground and ground circuit and A/D converting data is transmitted by the photocoupler.

The sampling rate for lead signal is 1000/960Hz, while the sampling rate for lead-fail signal is 100/120Hz, and the cut-off frequency for anti-aliasing low-pass filter(-3dB) is 200Hz. The sampling rate conforms with the standards of AHA (American) and CSE (European) which require that the sampling rate of electrocardiograph with the analysis function should be no less than 500Hz. The anti-aliasing low-pass filter can limit the input bandwidth of A/D converter while ensuring the wanted signal bandwidth to avoid the signal aliasing caused by the sub-sampling of high frequency signal.

(2) Block diagram for the amplifying unit

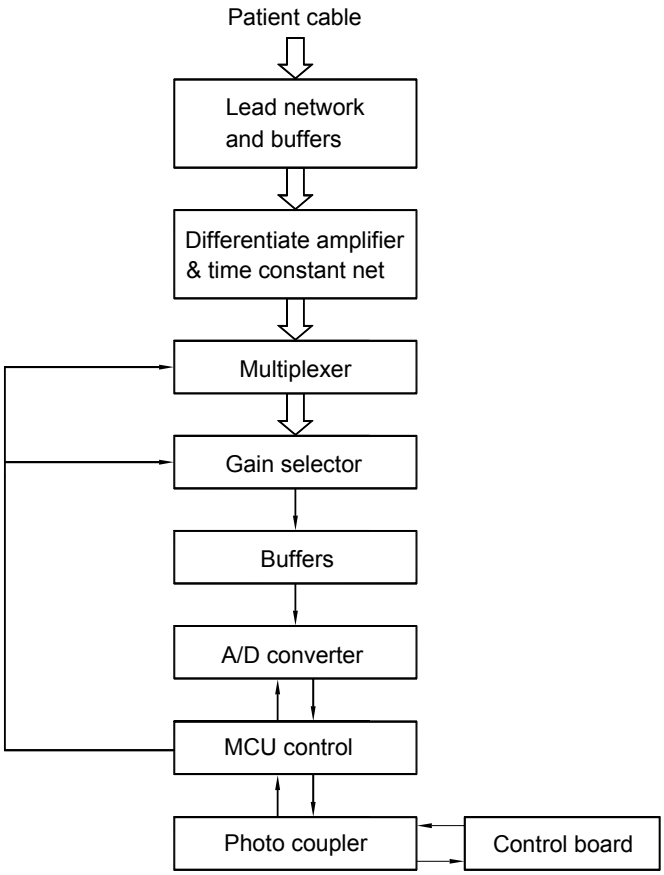


Figure3-7 Block diagram for the amplifying unit

3 Controlling

(1) Principle introduction for the control unit

The control system is composed of printing controller, keyboard controller, liquid crystal controller and CPU system, etc. The lead signal acquired by the signal capture system is transmitted by the high speed photocoupler to the CPU system, then subject to the processes of digital filtering, gain controlling and printing driving, finally transmitted to the printing controller to perform the printing of the waveform. After printing, the waveform will be measured, analyzed and processed by the CPU system. The CPU system can also receive the interrupt signals and the key coding from the keyboard to perform the key interruption processing. In addition, such functions as lead fail detection and paper compartment empty detection, battery voltage control, automatic turning off the power supply, CRO analogue output, sampling and printing for EXT input are all administrated by the CPU system. The

keyboard controller produces the keyboard scanning signals to perform the processing of key-jitter elimination, then the key coding and the interrupt signal is received and processed by the CPU system. The liquid crystal controller is responsible to the data and commands from the CPU system to perform the displaying the control status of the whole instrument.

(2) Block diagram of the control unit

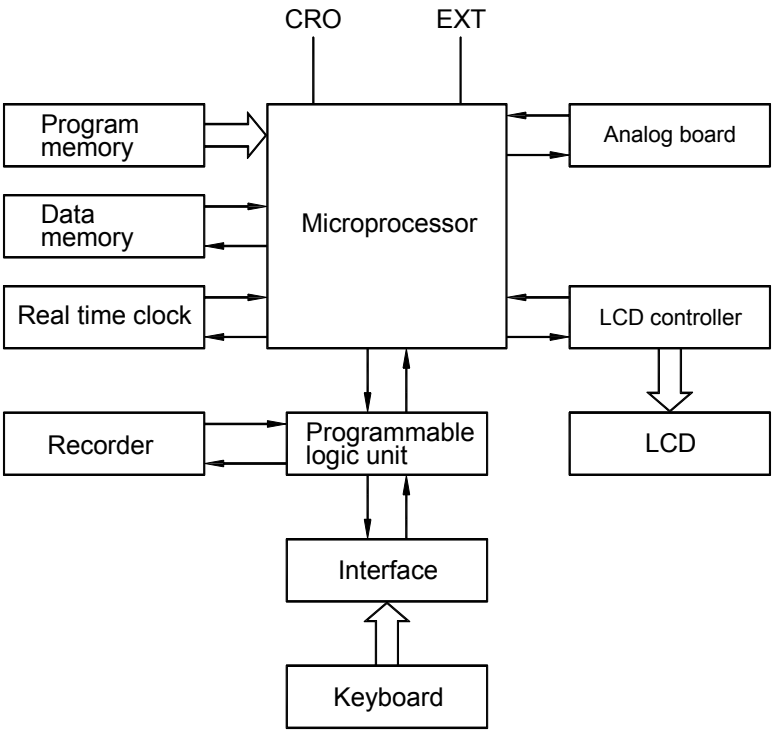


Figure3-8 Block diagram of the control unit

Chapter 4 Preparation before Operation

4.1 Location selection

ECG-300G is not to be limited to be used in hospitals and clinics. Because of the portable feature it can be used anywhere with the battery. It is applicable to outdoor occasions such as group examination.

The following aspects should be considered when selecting the location to install this instrument to recording the electrocardiogram accurately:

- Keep the instrument and the bed for testing away from the high voltage cable. The substantial radiation source around this instrument may introduce the noise interference to this instrument.
- Keep this instrument away from devices such as X-ray, ultrasound, radio machines and fluorescence light because they are probably the substantial radiation sources.
- Please use this instrument with the ambient temperature of 5℃~40℃.
- Please use this instrument with the ambient humidity of 30%~80% (without condensation).

4.2 Loading of the recording paper

ECG-300G can use the standard roll paper (63mm)

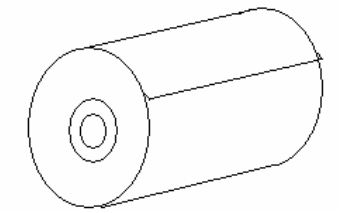


Figure 4-1Thermal recording paper—roll paper-63mm

The product uses thermo-sensitive paper as the recording media. In order to get clearly printed information, it is recommended to use the recording paper provided along with the product or purchase the same type of recording paper from the company. As the thermo-sensitive material is only sprayed on the front face of the recording paper, so the direction of the recording paper must be correct during installation, otherwise the printing cannot be realized. The installation sequence of the recording paper of the product is explained below:

a. Press the button at the position pointed by the arrow in the figure below to make the paper cartridge cover jump up and then remove the paper cartridge cover;

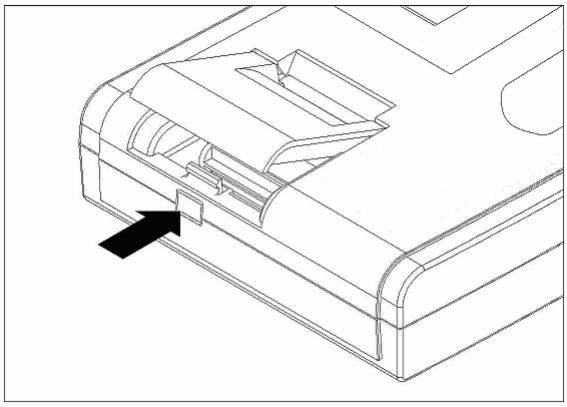


Figure 4-2 Installation paper step 1

b. Install the paper reel into the paper barrel in the direction indicated in the figure below, and put the paper barrel with recording paper into the paper cartridge and pull out a section of recording paper by 6cm in length. Please be aware that the end of the paper reel with a positioning pin must be installed into the corresponding clamping position in the paper cartridge.

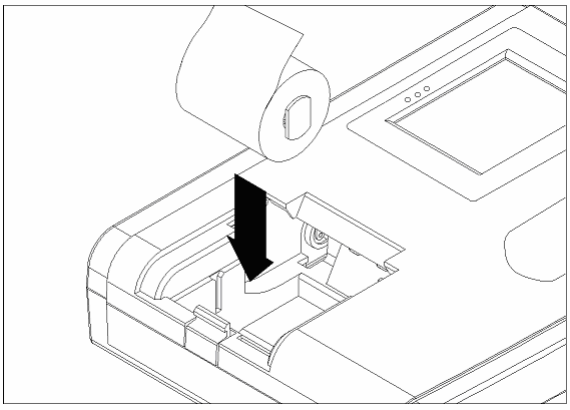


Figure 4-3 Installation paper step 2

c. Align the gear on the paper cartridge cover to the gear position on the paper cartridge, and press the end of the paper cartridge cover to lock it.

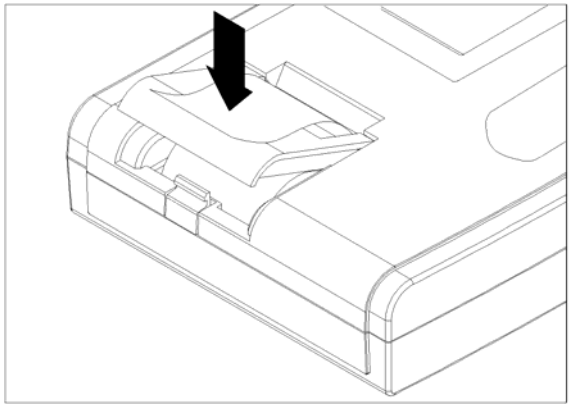


Figure 4-4 Installation paper step 3

Note:

The product has a paper out warning function. When the printing paper in the paper cartridge has been used up, the display interface of the product will appear warning information

(please refer to the chapter of "Warnings of the Product"). If the recording paper has not been properly installed, the product would not find the recording paper, and the paper out warning would not appear, then the installation of recording paper should be checked.

4.3 Connection of the power supply

1) Using the AC power supply

When the product uses AC power supply to work, firstly turn the AC power supply switch at the back of the product to "○"position, and connect the opening end of the grounding wire to the grounding post of the product, and then connect the other end of the grounding wire with crocodile clips to the dedicated grounding point in the working environment. This kind of grounding connection must be reliable, otherwise just use the AC power supply to charge the battery of the product, and not directly use the AC power supply to run the product on animals. When the grounding line is properly connected, insert one end of the power cord provided along with the product to the AC input terminal of the product, and the other end (plug) to the network power supply socket, as shown in the figure below.

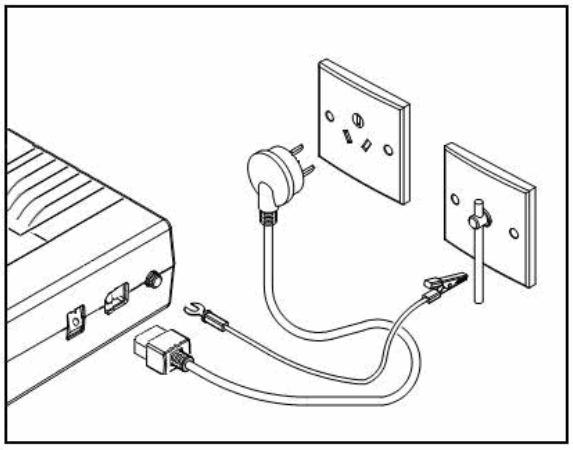


Figure 4-5 Connection of the AC power supply

When this instrument is used with other medical devices, please use the external grounding cable provided together with this instrument. Connect the grounding terminal of this ECG with the same grounding terminal of the other devices to prevent the animal from the electrical shock. When there is any leak current with the other devices, this connection will induce it into the ground for protection.

2） Using the battery

When the battery is required to be used as a power supply, the built –in rechargeable battery can be used without loading by users. Please check the capacity and status of the battery before use it.

Note:

The reliability of grounding for this instrument can be enhanced by connecting one end of the accessorial grounding cable onto the grounding column of the instrument while connecting the other end to the ground. Do not use the water pipe or the other pipes as a grounding cable, or else the safety protective measure of first level of this instrument is ineffective, and the animals might be in danger of electrical shock.

4.4 Connection of lead lines

The connecting position on the product to the lead is shown in the figure below. When the plug of the lead is fully inserted into the lead socket of the product, turn the two fastening bolts on the lead plug to lock the lead onto the product and prevent loosing.

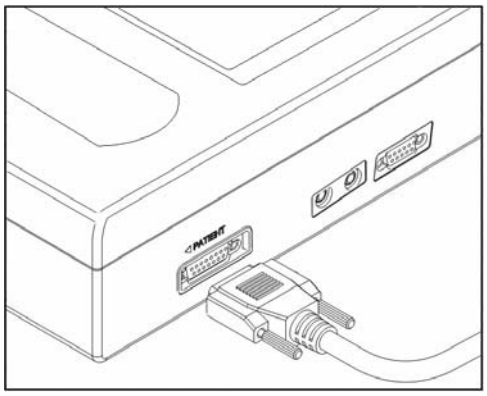


Figure 4-6 Connection of lead lines

Note:

Please use the lead provided along with the product, otherwise the working efficiency of the product may be degraded and the product may be damaged.

4.5 Start the instrument

As the flowing picture, press the operating button of 

(ON/OFF), the power supply indicator light will light and the instrument turns to be in a initial status.

When the instrument enters into the system and the following initial picture is displayed on the LCD screen, it indicates that this instrument has entered into the stand-by status and you can start operating.

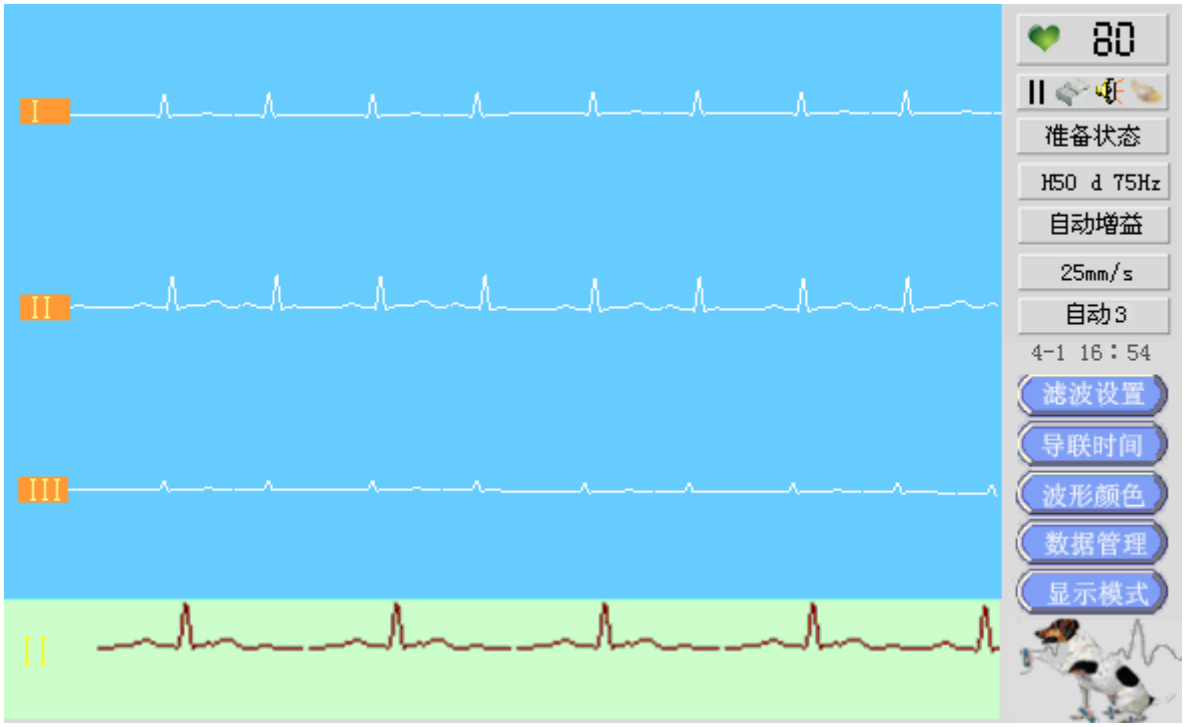


Figure 4-7 Boot screen display

4.6 Animal cable connection

Animal cable includes two parts, main cable and lead wires with associated electrode connectors. The electrode connectors can be distinguished from the color and identifier on them.

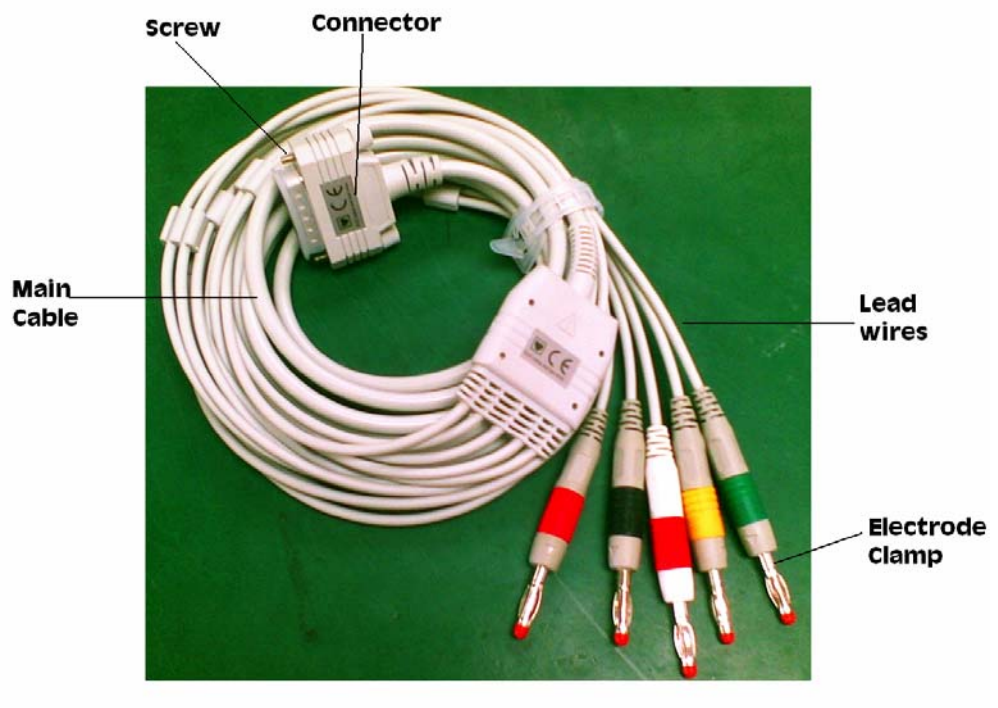


Figure4-8 Animal lead wires

The identifier and color code of electrodes used comply with IEC requirements. In order to avoid incorrect connections, the electrode identifier and color code are specified in as follow table. The equivalent code of American standard is given too.

Lead（V） is set to ON：

Table 4-1 Table of Code Symbols and Colors of Electrodes and Lead Line

	International Standard		American Standard	
Electrode	**Identifier**	**Color Code**	**Identifier**	**Color Code**
Front Right Leg	R	Red	RA	White
Front Left Leg	L	Yellow	LA	Black
Back Right Leg	N	Black	RL	Green
Back left Leg	F	Green	LL	Red

Chest	C	Red	V	Red

Lead（V） is set to OFF：

Table 4-2 Table of Code Symbols and Colors of Electrodes and Lead Line

	International Standard		American Standard	
Electrode	**Identifier**	**Color Code**	**Identifier**	**Color Code**
Front Right Leg	R	Red	RA	White
Front Left Leg	L	Yellow	LA	Black
Back Right Leg	N	Black	RL	Green
Back left Leg	F	Green	LL	Red

4.7 Connection between Electrode and Animal Body

Veterinary electrode adapter is required for ECG-1103 VET, the end with clip is for connection to the animal, and the end with connector is for connection to Animal cable, illustrated as below .The contacting resistance between the animal and the electrode will affect the quality of ECG waveform greatly. In order to get a high-quality ECG waveform, the skin/electrode resistance must be minimized while connecting electrodes.

1) Only use the attached electrode or the one-off electrode in good quality;
2) Do not mix the attached electrode and the one-off electrode;
3) Do not use the oxidized electrode;
4) Do not mix the new and old electrode;
5) Use medicinal alcohol to clean the contact part of the animal body and electrode, in order to reduce the contact resistance;
6) Do not stick any spacer to the contact part of the electrode and animal body;
7) Prevent a short circuit between electrodes in signal acquisition (the chest electrode is likely to be touched);
8) Make sure the electrode is reliably connected to the lead.

4.7.1 Connection between Limb Electrode and Aniaml Body

Install each electrode to the position (wrist, ankle) on the corresponding limb specified in the table below:

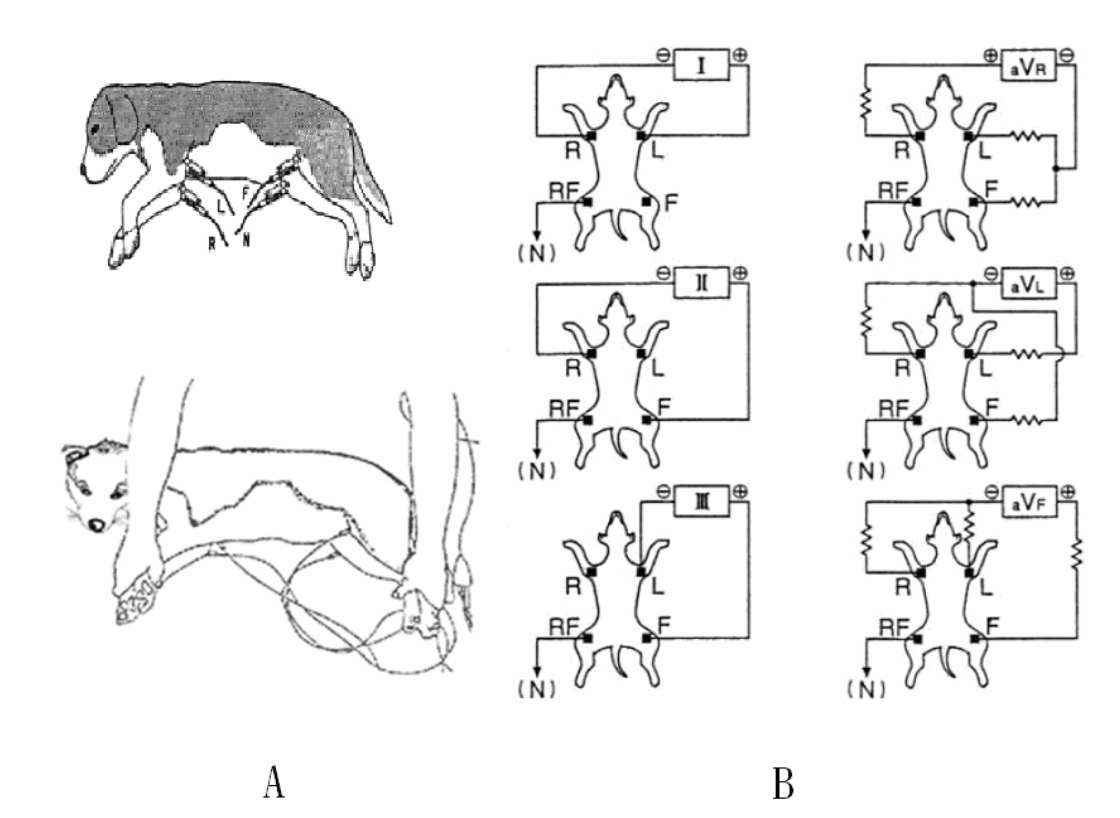


Figure 4-9 System Diagram of Lead

4.7.2 Connection of electrode

Connect the electrode to front right leg(R/Red), front left leg(L/yellow), back left leg(F/green) and back right leg(N/black), illustrated as below

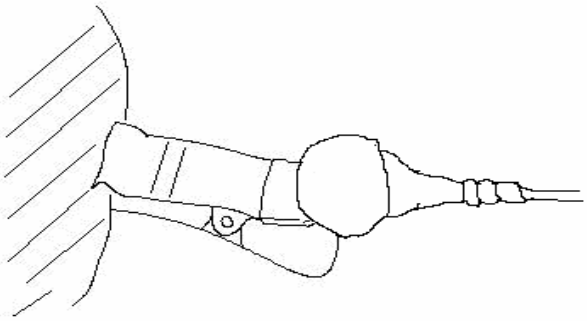


Figure 4-10 Animal Electrode connection

Note：

Please apply some alcohol to the clip skin for optimal connection.

PROBLEM SOLVING WITH CATS

Unlike humans and most dogs, the cardiac axis is not aligned top right to bottom left in cats. The heart has a tendency to lie more centrally with its apex more ventral than the atria, i.e., the

heart points downward towards the ground when the animal stands.

This gives rise to one of the common problems with monitoring cats, finding the strongest signal to present to the R and F electrodes.

The best signal is derived top/bottom axis i.e. Lead II in humans, with R looking at the top of the heart and F at the bottom. In cats, as stated, the axis may not lie across the body.

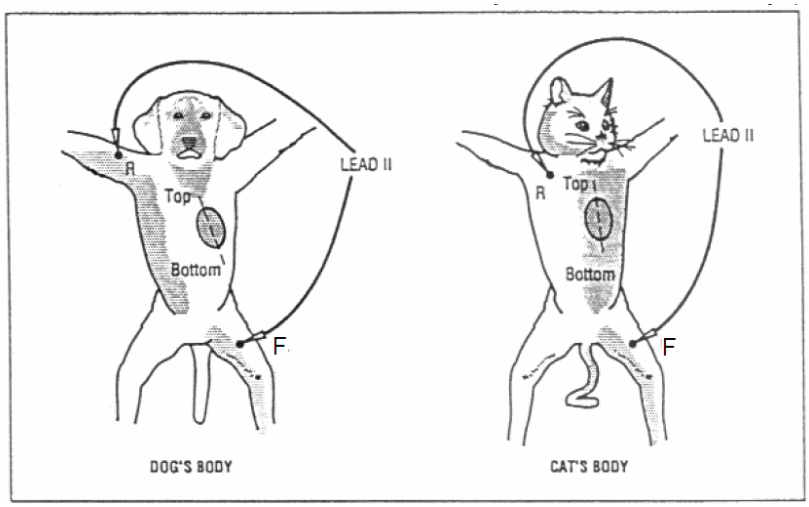


Figure 4-11 Dogs and cats lead wire connection

As lead II may not align with the cat's axis, the signal is small and sometimes cancels. Therefore, by moving R more centrally onto the cat's body above the top, and F onto the cat's body below the bottom of the heart, a much larger signal will be obtained.

The plane in which the cat's heart lies within its body may also vary.

The "top" of the heart may be more dorsal and the "bottom" more ventral. In this case, we would refer to the base/apex axis (see figure as below) when the following instructions should be followed.

1. Move F to the left apex of the heart.
2. Move R to the V10 position (over the dorsal spinous process of the seventh thoracic vertebra) and F to the V4 position (sixth left intercostal space at the costochondrail junction). It will be necessary to annotate the printouts, if any, with actual configurations used to avoid later confusion.

Figure 4-12 Cats lead wire connection

⚠ **WARNING:**

The ECG is provided for the use of qualified physicians or personnel professionally trained. The operator is supposed to be familiar with the contents of this User's Manual before use.

4.8 Indication for lead fail

This instrument will check the lead connection all along, and if the lead fail is detected, the detached lead line code willl be displayed in the approriate lead position.

The screen will display the following picture:

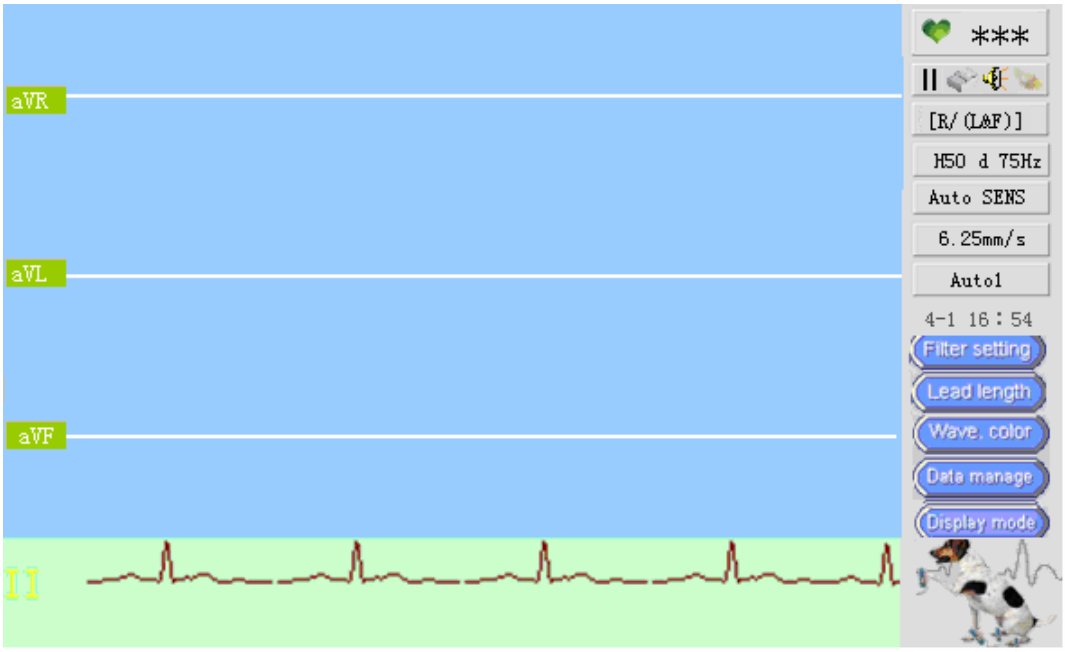


Figure 4-13 Indication for lead fail

If the lead fail occurs, the approriate waveform will not be displayed, and the "record" button is ineffective. The users should reconnect the electrodes or electrodes lead based on the given information for the detached electrodes or the electrodes lead.When the lead lines failed off, it will no longer to analysis the wave, and the print report display "lead is disconnected, cannot be analyzed".

Note:

1. [*]:

① When the lead line with the animals or host is not reliable connectivity, ECG can not correctly send, that "*" of the symbols is displayed to warn , "*" indicates the current lead;

② when polarization voltage is over specified value of equipment, the symbol is displayed to warn.

2. In the course of use, "*" of the symbols is displayed to warn the screen, to dealt with according to the following approach:

① Press "lead shutting off " button to intervene manually, to eliminate the effects of strength exceeds the value of the polarization voltage on the amplifier products, will enable amplifiers rapid return to normalcy;

② Press "lead shutting off " button to intervene manually, still can not lift a state of alert, they should double-check the connection of the corresponding electrode and the skin of animal , the electrodes and l the lead lines or host of is reliable, when such a reliable connection, the state of alert lifted.

Chapter 5 Operation Procedures

5.1 Inspection before Operation

- Is the grounding connection correct?
- Is the grounding wire complete?
- Is the grounding wire connection normal?
- Is the grounding bolt is tightened?
- Is the connection between the grounding wire joint on the wall and the grounding wire correct?
- Is there any electrical equipment which may introduce the radio-frequency or the power supply interference such as X-ray, ultrashort wave device around this instrument? If there is, they may introduce the interference to the ECG instrument. If necessary, please turn off this equipment or perform the test in another location without interference.
- Is the ambient temperature and humidity in compliance with the requirements for using this instrument?
- Is the connection of power supply cable good? Or is it intertwisted with other cables?
- Is the connection of lead lines good? Or are the lead lines close to the AC power supply cable?
- Is the connection between the lead line pins and appropriate electrodes correct?
- Is the connection of electrodes good?
- Is the electrode contacting skin of the tested animal subject to the appropriate pretreatment?
- Have the electrodes been contaminated? If they have, please remove the stains with the alcohol and the soapsuds.
- Is the connection of electrodes too loose? If it is, please tighten them.
- Are the new and old electrodes used together?
- Is there any contact between different electrodes (particularly in the chest area)
- Do the naked parts of the animal body such as hand an foot contact the metal part of the bed? If they do, the AC interference may be introduced to the electrocardiogram tracing.
- Is the examination room comfortable?
- Is the quantity of the recording paper sufficient?

Note:

For the safety of the examined animal and stability of the electrocardiogram recording, the above inspection should be finished before operation. Make sure all the conditions about the instrument and animal normal before electrocardiogram recording.

5.2 Electrocardiogram recording screen

Start the instrument and make sure all the lead connection is correct, and then the electrocardiogram can be recorded. The following electrocardiogram recording screen (Figure 5-1) will be displayed on the LCD:

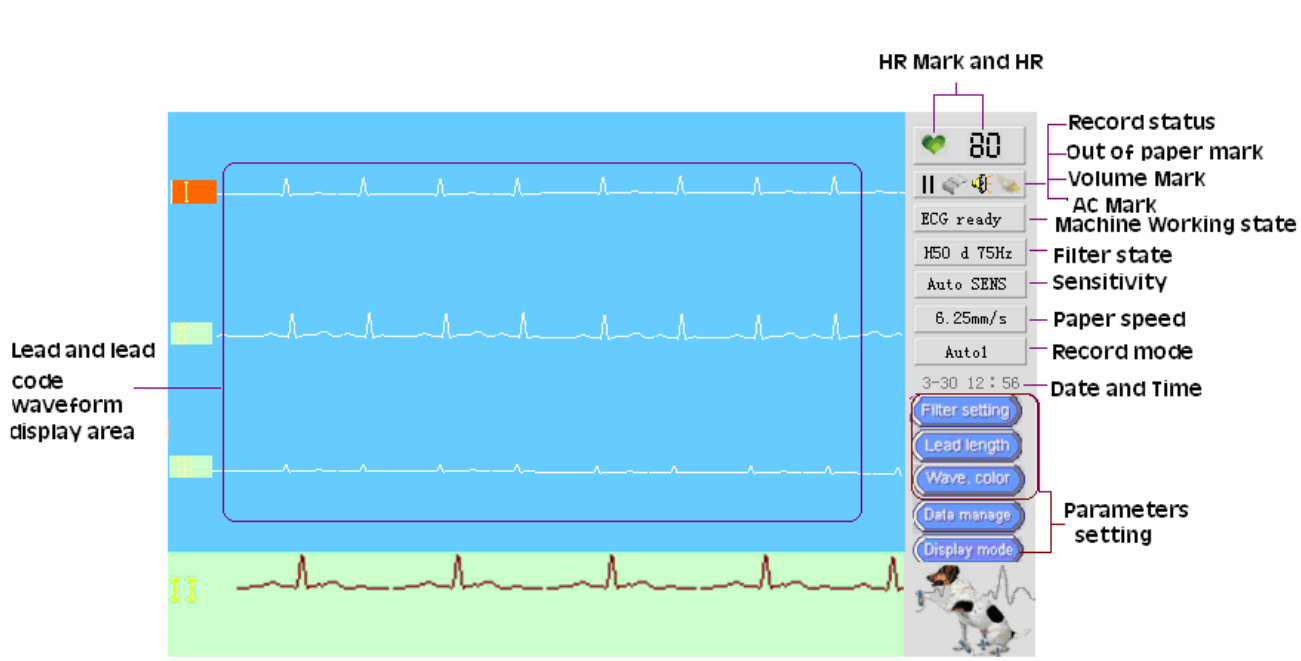


Figure 5-1 Electrocardiogram recording screen

5.3 Electrocardiogram recording operation

To perform the electrocardiogram recording , Please choose a recording mode(operating mode) first .There are two recording manners as automatic recording and manual recording with 6 recording modes as the following picture(Figure 5-2):

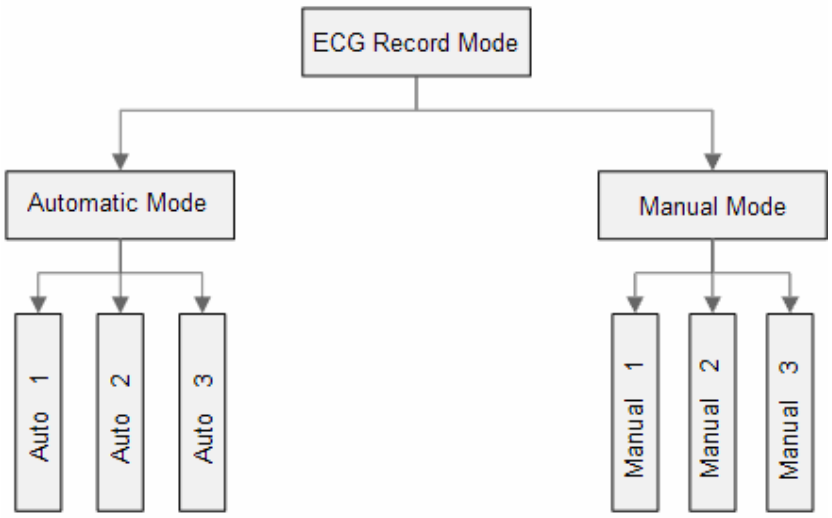


Figure 5-2 Electrocardiogram recording mode diagram

■ Functions and Features of the Product in Various Recording Modes

Table 5-1 Description of the Functions and Features in Various the Recording modes

Recording Mode	Description of the Functions and Features
Auto 1	On the recording paper, only the signals of one lead can be recorded in each recording cycle in the longitudinal direction, and the lead can be automatically changed when each recording cycle is finished, and the waveforms of the signals of all leads are recorded in the transverse direction (for example: Ⅰ→Ⅱ→Ⅲ→aVR→aVL→aVF→V, [if "Lead（V）" is set to ON）, 6 or 7 recording cycles in all)], and then the results of automatic analysis can be printed or stored according to the operator's selection.
Auto 2	On the recording paper, the signals of two leads can be recorded in each recording cycle in the longitudinal direction, and the lead can be automatically changed when each recording cycle is finished, and the waveforms of the signals of all leads are recorded in the transverse direction (for example, the recording sequence when the rhythm lead selection is II lead is as follows: Ⅰ+Ⅱ→Ⅱ+Ⅱ→Ⅲ+Ⅱ→ aVR+Ⅱ→ aVL+Ⅱ→ aVF+Ⅱ→V+Ⅱ [if "Lead（V）" is set to ON）6 or 7 recording], and then the results of automatic analysis can be printed or stored according to the operator's selection. Among them, the second lead signal in the longitudinal direction is the selectable rhythm lead signal.
Auto 3	On the recording paper, the signals of three leads can be recorded in each recording cycle in the longitudinal direction, and the lead can be automatically changed when each recording cycle is finished, and the waveforms of the signals of all leads are recorded in the transverse direction (for example: Ⅰ+Ⅱ+Ⅲ→ aVR+aVL+aVF→V[if "Lead（V）" is set to ON, 3 or 4 recording cycles in all], and then the results of automatic analysis can be printed or stored according to the operator's selection.

Manual 1	On the recording paper, only the signals of one lead can be recorded in the longitudinal direction, the waveforms of the signals of the current lead are recorded continuously unless the lead is changed manually (for example: Ⅰ → ……).
Manual 2	On the recording paper, the signals of two leads can be recorded in the longitudinal direction, one of them is the currently selected rhythm lead, and the waveforms of the current lead and rhythm signals are recorded continuously unless the lead is changed manually (for example, when the rhythm lead selection is II lead: Ⅰ + Ⅱ → ……).
Manual 3	On the recording paper, the signals of three leads can be recorded in the longitudinal direction,, and the waveforms of the signals of the current leads are recorded continuously unless the leads are changed manually (for example: Ⅰ + Ⅱ +Ⅲ→ ……).

- Description of the Relevant Information on the Display and Recording Paper in Each Recording Mode(Information shown in the following diagrams may be different in different parameter settings of various options, so is for reference only)

1) Automatic recording

- **Auto 3 (Automatic 3 channel)**

The default recording mode of this instrument when leaving factory is “Automatic 3 channel” The whole instrument work status will be displayed on the LCD screen as the following picture (Figure 5-3):

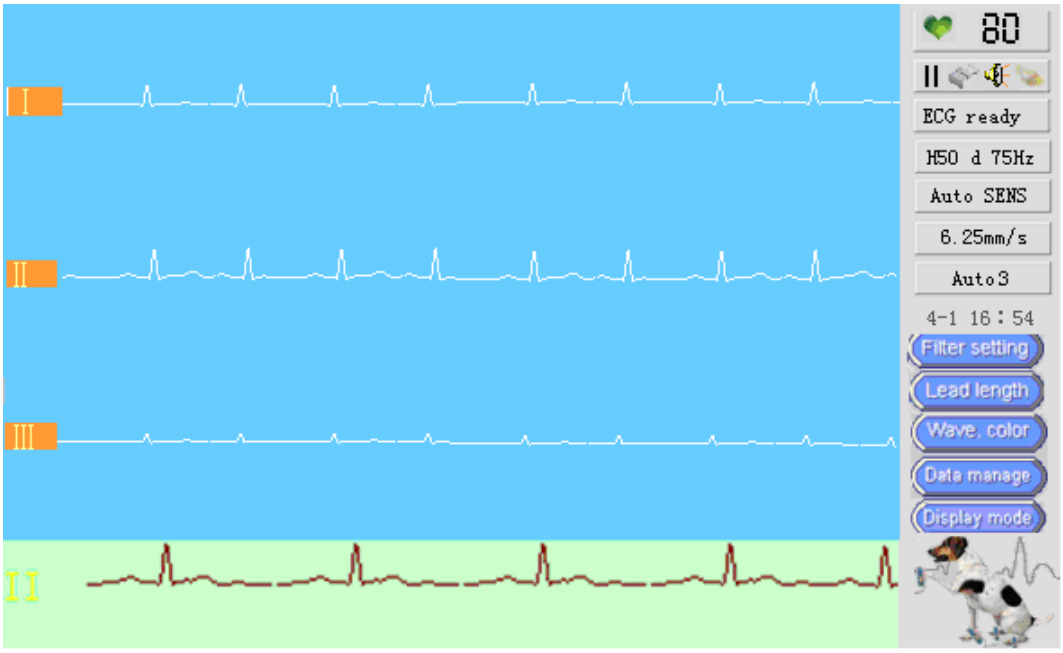


Figure 5-3 Instrument work status of Auto 3

Observe that if the lead ECG waveform is stable in the rough from the displaying of heart rate. If necessary, press the RESET button of “lead shutting off” to stabilizer all the lead waveform instantly.

a, Press MODE button, you can choose other record mode ,such as "Auto 1 ","Auto 2 ","Manual 1 ", "Manual 2 " and "Manual 3 ;

b, Press mm/s CH button to choose the speed, There are 4 levels of recording speed provided by this instrument as :6.25 mm/s、12.5 mm/s、25 mm/s and 50 mm/s.

c, Press OK button, the parameter area appears red background, then select the filter settings, and press the LEAD button to change the filter state. There are 4 types of filter status provided by this instrument as : 0.05Hz -150Hz、H50 d、H50 d 75Hz、H50 d 35Hz.

The following table is the detailed description about the various parameters in the filter setting:

Table 5-2 various parameters in the filter setting

Status or Control Items	Setting Value	Comment

Filter Setting:	0.05Hz 150Hz	All filters are off.
	H50 d	Only AC filter and drift inhibition（0.5Hz Highpass） are on.
	H50 d 75Hz	All filters are on, and the frequency of the myoelectrical filter is 0.5-75Hz
	H50 d 35Hz	All filters are on , and the frequency of the myoelectrical filter is 0.5-35Hz

Note:

- **The H50 in the H50 d 75Hz will be displayed varying with the set AC frequency. For instance, when the AC frequency is set to 60Hz, H60 d 75Hz will be displayed.**
- **The default state of the flitter is 0.5Hz -35Hz when boot scrap.**

d, Press 

button (Starting /Stop button) to start recording. and the symbols of "◀", "⏸" indicate the acquiring/ recording status respectively . The leading code which is currently recorded will be displayed in the reverse type as the following picture(Figure 5-4):

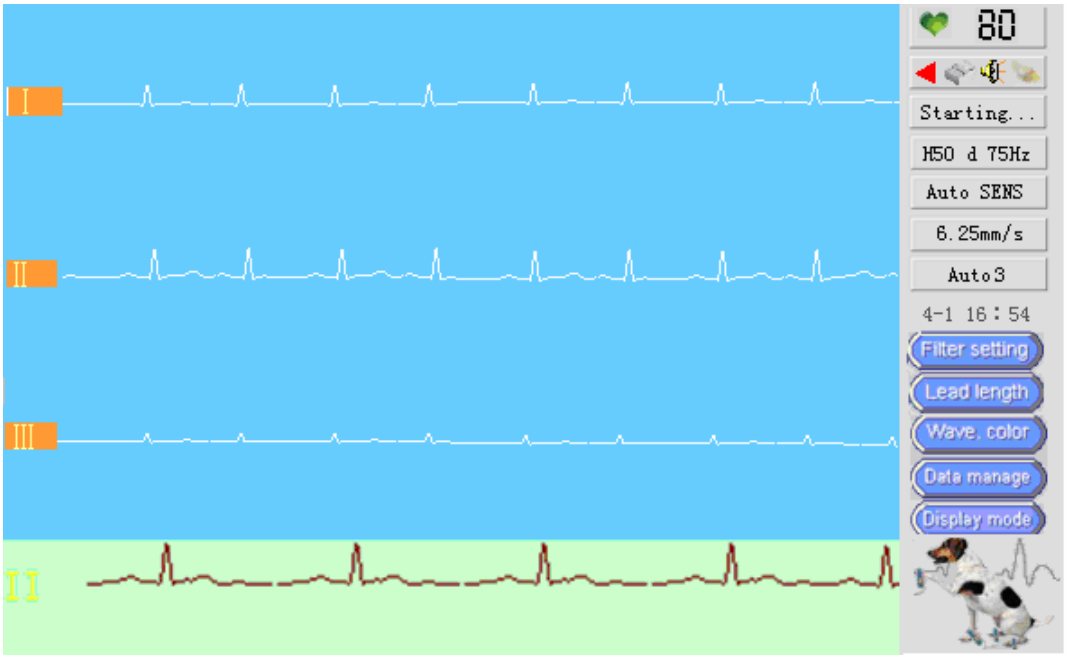


Figure 5-4 Acquisition and display

After the ECG recording, system will automatic analysis and storage, it will display the measurement result after analysis.

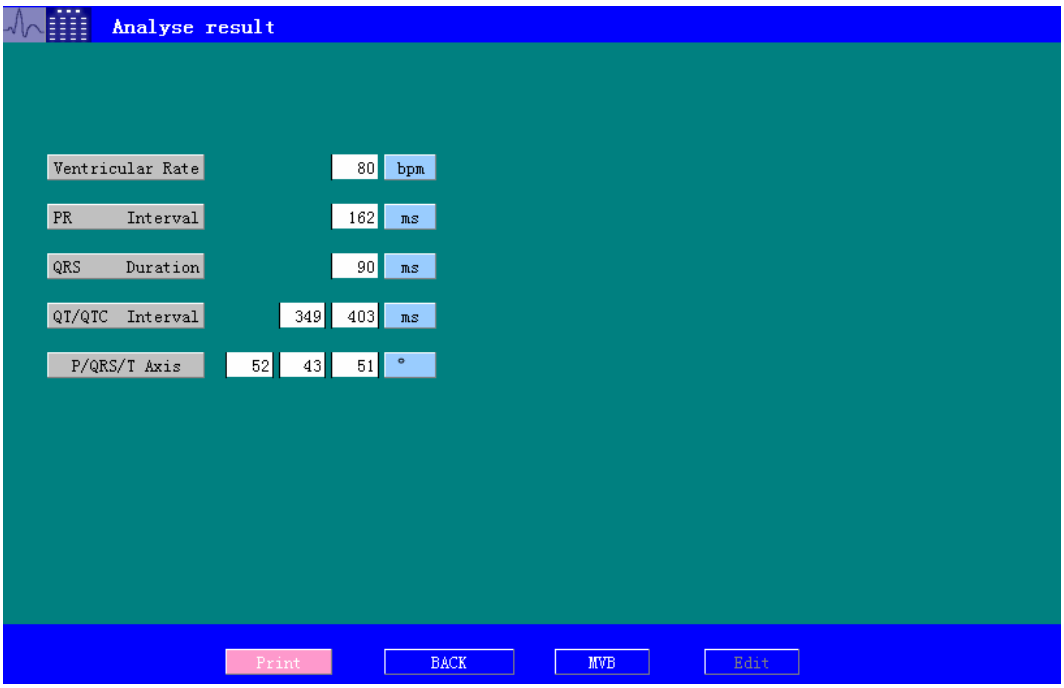


Figure 5-5 Analyse result

As shown above, in the measurement results interface, you can select "Print ", "Return", and “MVB”.

Three standard waveforms recorded Legend:

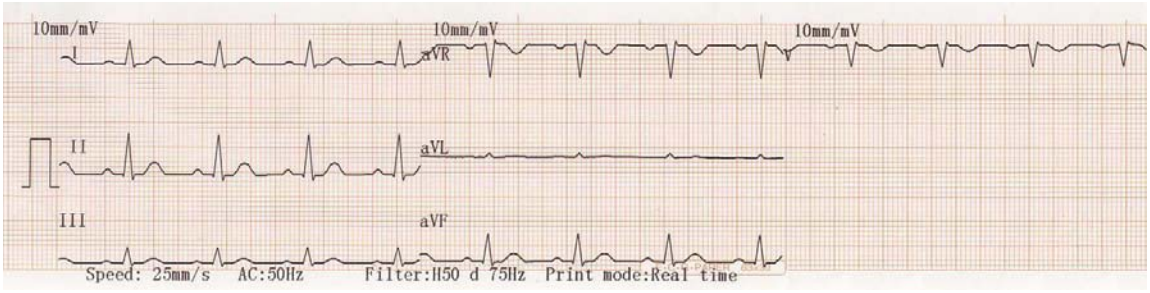


Figure 5-6 Auto 3 mode image of the information on the recorder

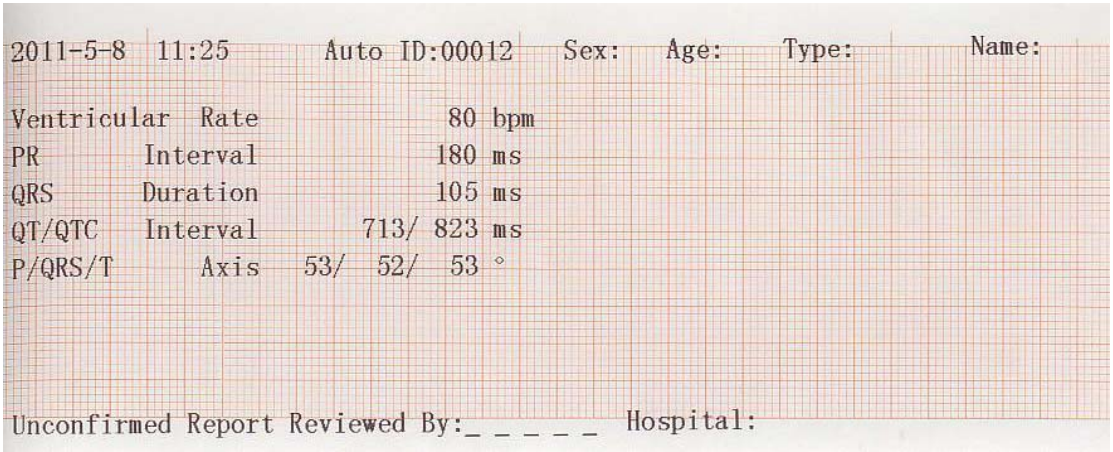


Figure 5-7 Auto 3 mode detailed report information on the recorder

MvB:

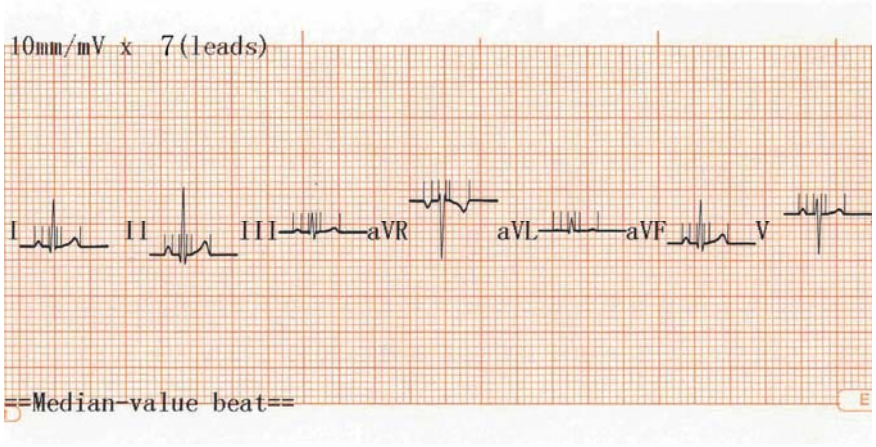


Figure 5-8 Auto 3 mode MVB report information on the recorder

■ **Auto 1 (Automatic 1 channel)**

This mode is the single automatic 1 channel, press the MODE button (Mode switching button) to select (Auto 1), LCD display the working status of machine, as shown below (Figure 5-9):

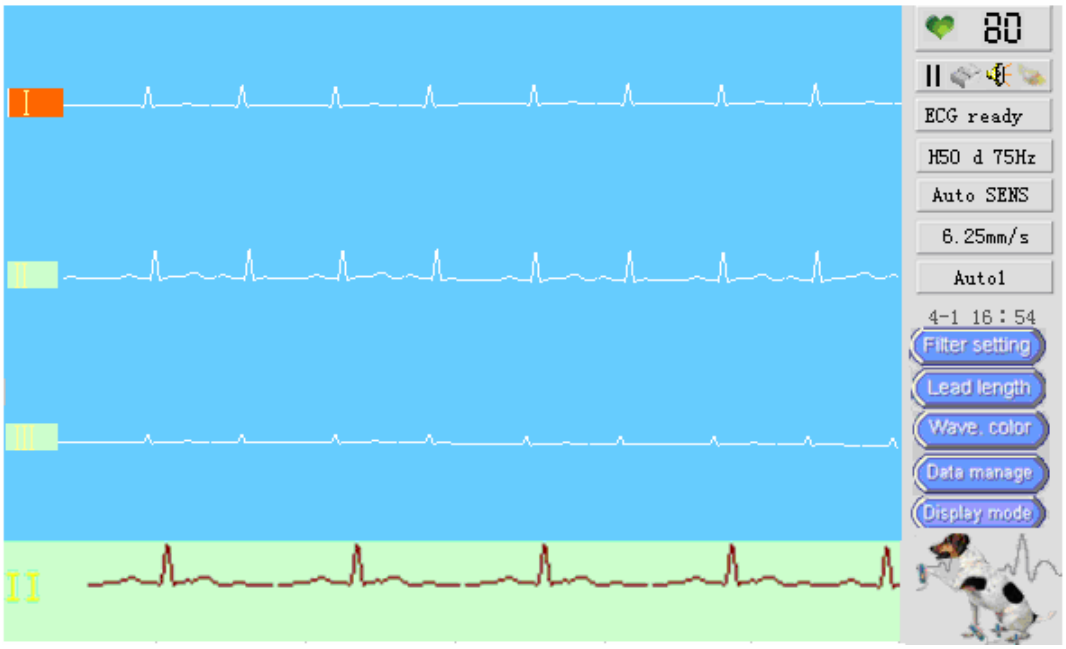


Figure 5-9 Instrument work status of Auto 1

Observe that if the lead ECG waveform is stable in the rough from the displaying of heart rate. If necessary, press the RESET button of “lead shutting off” to stabilizer all the lead waveform instantly.

a, Press MODE button, you can choose other record mode ,such as "Auto 1 ","Auto 2 ","Manual 1 ", "Manual 2 " and "Manual 3 ";

b, Press mm/s CH← button to choose the speed, There are 4 levels of recording speed provided by this instrument as :6.25mm/s、12.5mm/s、25mm/s and 50mm/s.

c, Press OK button, the parameter area appears red background, then select the filter settings, and press the ◄ ► LEAD button to change the filter state. There are 4 types of filter status provided by this instrument as : 0.05Hz -150Hz、H50 d、H50 d 75Hz、H50 d 35Hz.

d, Press START/STOP button (Starting /Stop button) to start recording. and the symbols of “◀”, “II” indicate the acquiring/ recording status respectively . The leading code which is currently recorded will be displayed in the reverse type as the following picture:

One standard waveform recorded Legend:

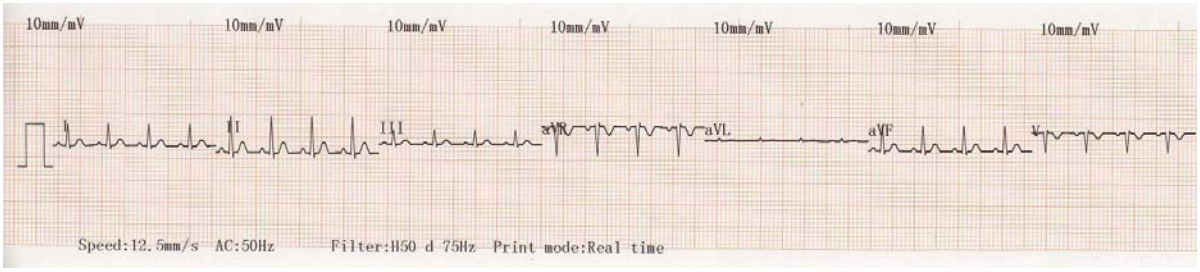


Figure 5-10 Auto 1 mode image of the information on the recorder

■ **Auto 2 (Automatic 2 channel)**

This mode is the automatic 2 channel, press the MODE button (Mode switching button) to select (Auto 2), LCD display the working status of machine, as shown below (Figure 5-11):

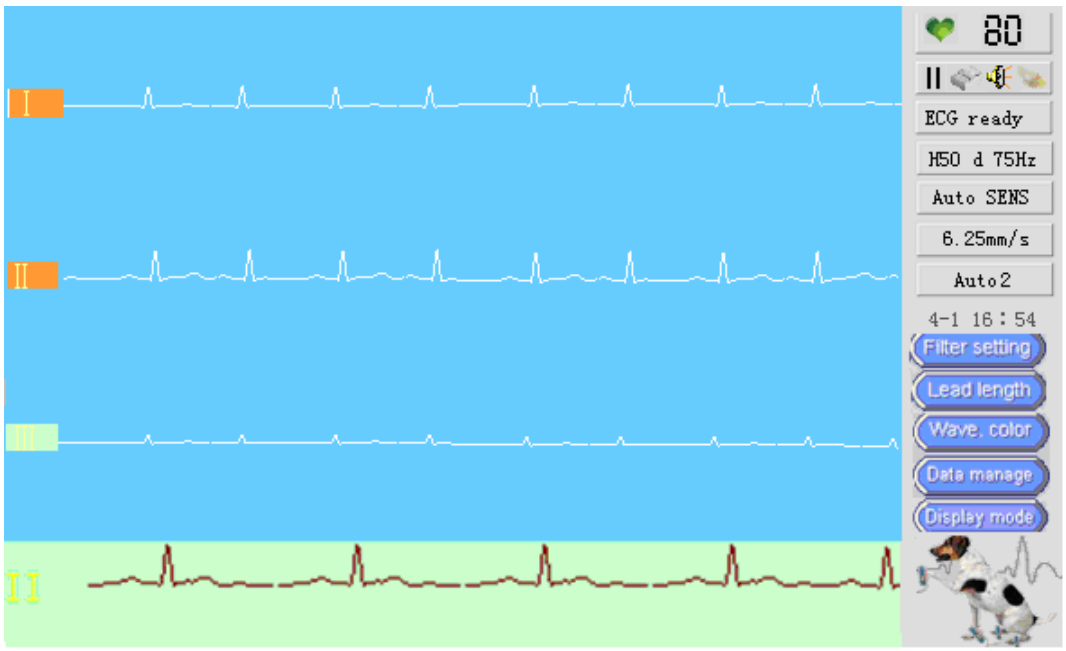


Figure 5-11 Instrument work status of Auto 2

Observe that if the lead ECG waveform is stable in the rough from the displaying of heart rate. If necessary, press the RESET button of "lead shutting off" to stabilizer all the lead waveform instantly.

a, Press mm/s CH button to choose the speed, There are 4 levels of recording speed provided by this instrument as :6.25 mm/s、12.5 mm/s、25 mm/s and 50 mm/s.

b, Press OK button, the parameter area appears red background, then select the filter settings, and press the LEAD button to change the filter state. There are 4 types of filter status provided by this instrument as : 0.05Hz -150Hz、H50 d、H50 d 75Hz、H50 d 35Hz.

c, Press START/STOP button (Starting /Stop button) to start recording. and the symbols of "◀", "II" indicate the acquiring/ recording status respectively . The leading code which is currently recorded will be displayed in the reverse type as the following picture:

Two standard waveforms recorded Legend:

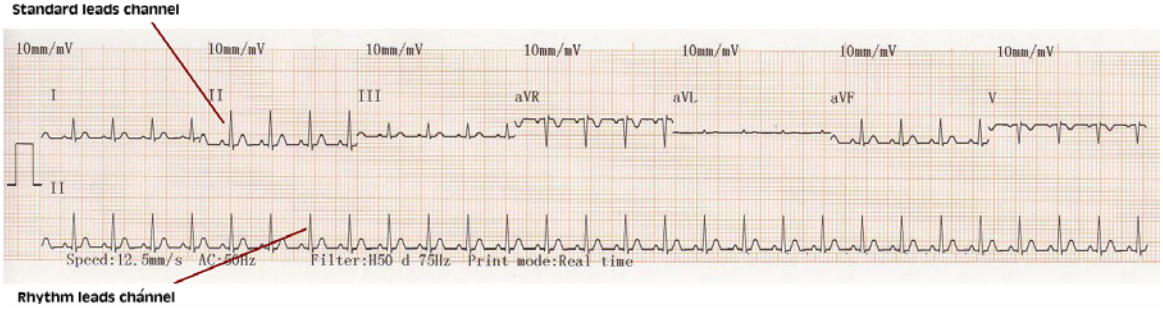


Figure 5-12 Auto 2 mode image of the information on the recorder

As shown above, the up line is the standard single-channel record mode, the downlink is the rhythm mode, and you can set the rhythm lead in the menu. (see "Parameter setting").

Note:

- **Under the automatic recording mode, the leads are unable to be changed through the** 

button during recording. The code of lead which is currently recorded will be displayed in the reverse type. You can press the calibration button to print the calibration signal during recording for examining the current sensitivity. However, in this recording mode, the sensitivity is set to "Automatic Gain" and thus unable to be adjusted.

- **This instrument possesses the function of automatic analysis, however, it just performs the automatic analysis based on the acquired electrocardiogram waveform without considering the total condition of the animal, and there may be some discrepancies between the instrument's automatic analysis result and the physician's diagnosis result. Thus the final conclusion should be made by the physician based on a multi-analysis and diagnosis in combination with the analysis result, clinic symptom of the animal and the other examination result.**

2) Manual Mode

This instrument provides manual mode for recording ECG waveform, and including 5 manual recording modes such as "Manual 1 channel", "Manual 2 channel", "Manual 3 channel", Under the manual recording mode, you can switch to the wanted leading or leading group freely. However, under this mode, the instrument is unable to perform analysis to the acquired waveform and output the measurement result as well.

- **Manual 3 (Manual 3 channel)**

After starting the instrument, you can Press 

button to select the "Manual 3 channel" with the same operating method of recording mode as "Automatic 3 channel". This mode is the manual mode corresponding to "Automatic 3 channel" mode, and the work status of the whole instrument will be displayed on the LCD screen as the following picture (Figure 5-13):

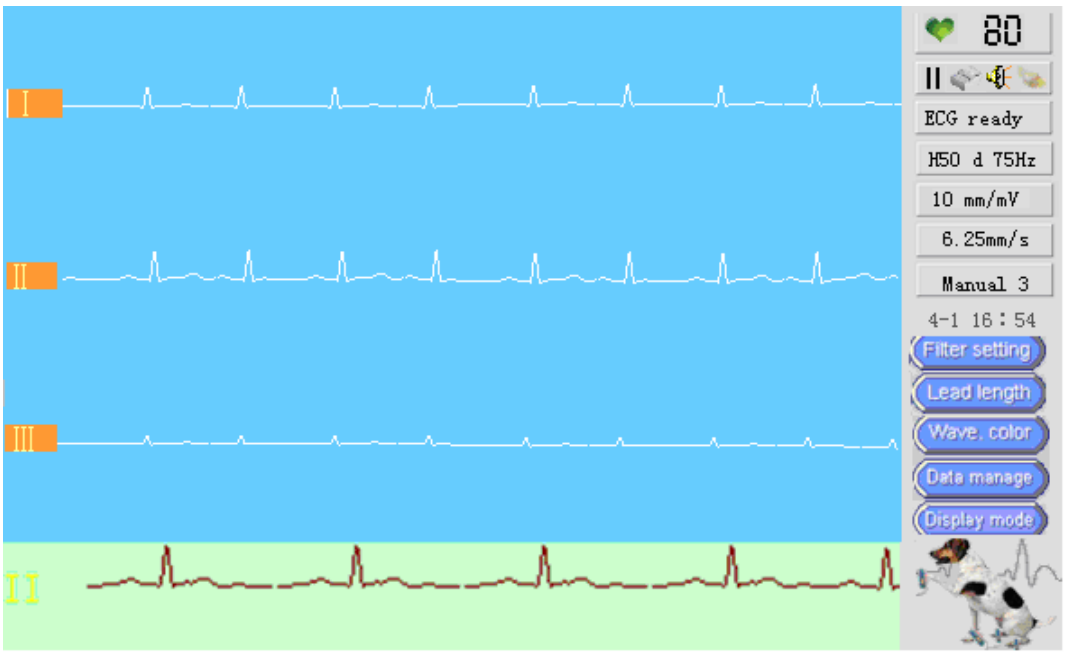


Figure 5-13 Instrument work status of Manual 3

a, Press 

button to choose the speed, There are 4 levels of recording speed provided by this instrument as :6.25mm/s、12.5mm/s、25mm/s and 50mm/s.

b, Press 

button to choose the sensitivity, there are four levels: : 2.5mm/mv、5mm/mv、10mm/mv、20mm/mv;

c, When the waveform is stable, press 

button ((record / stop record button) to start recording, during the record process, you can press 

button to choose the recorded lead group, the length of time for lead group is controlled by the user, the recording lead code is highlighted , if interrupt or end the recording, please press the 

button (Start/stop record)to return to the recording state.

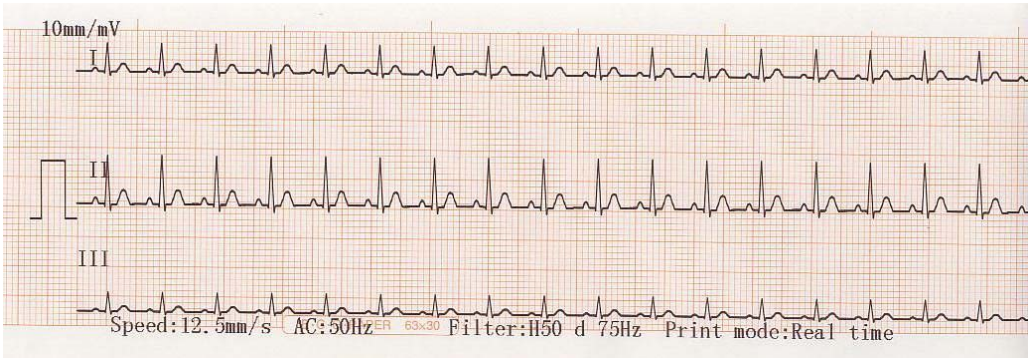


Figure 5-14 ECG Legend of Manual 3

■ **Manual 1 (Manual 1 channel)**

This mode is the manual recording mode corresponding to the "Automatic 1 channel", and the work status of the whole instrument will be displayed on the LCD screen as the following picture (Figure 5-15):

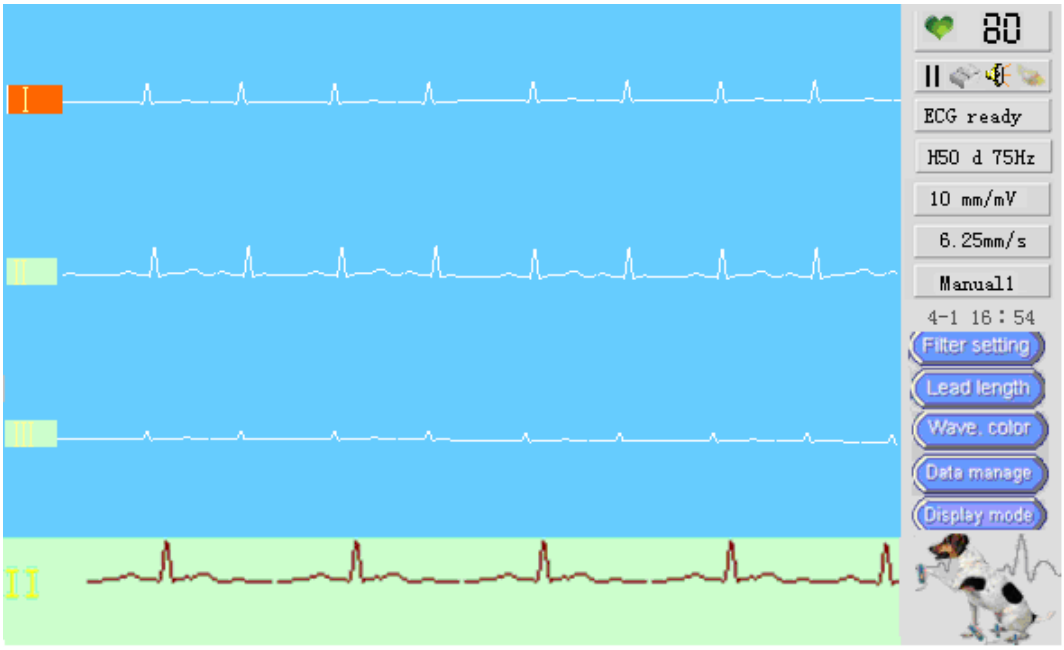


Figure 5-15 Instrument work status of Manual 1

Note:

Please refer to the recording mode of "Manual 3 channel" for the detailed operations and recording.

■ **Manual 2 (Manual 2 channel)**

This mode is the manual recording mode corresponding to the "Automatic 2 channel", and the work status of the whole instrument will be displayed on the LCD screen as the following picture (Figure 5-16):

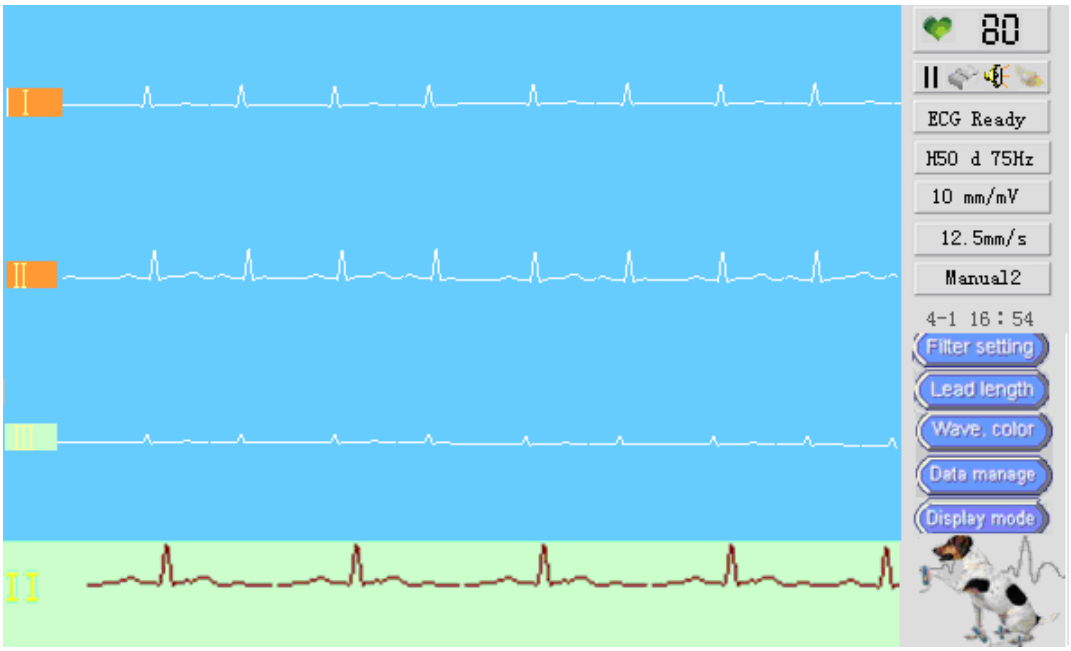


Figure 5-16 Instrument work status of Manual 2

Note:

Please refer to the recording mode of "Manual 3 channel" for the detailed operations and recording.

The lead switch sequence

Switch to right lead button (LEAD/□ button) is for switch to the right lead in manual and rhythm modes during recording.

The lead switch sequence in various recording modes is as follows:

"Lead（V）" is set to ON:

Automatic 1 channel (Standard 1 channel automatic mode):

Ⅰ→Ⅱ→Ⅲ→aVR→aVL→aVF→V→Ⅰ→Ⅱ→Ⅲ……

Automatic 2 channel (Standard 2 channel automatic mode):

Ⅰ, Ⅱ→Ⅱ, Ⅱ→Ⅲ, Ⅱ→aVR, Ⅱ→aVL, Ⅱ→aVF, Ⅱ→V, Ⅱ……..

Automatic 3 channel (Standard 3 channel automatic mode):

Ⅰ, Ⅱ, Ⅲ→aVR, aVL, aVF→V……

Manual 1 channel (Standard 1 channel manual mode):

Ⅰ→Ⅱ→Ⅲ→aVR→aVL→aVF→V→Ⅰ→Ⅱ→Ⅲ……

Manual 2 channel (Standard 2 channel manual mode):

Ⅰ, Ⅱ→Ⅱ, Ⅱ→Ⅲ, Ⅱ→aVR, Ⅱ→aVL, Ⅱ→aVF, Ⅱ→V, Ⅱ→→Ⅰ, Ⅱ……

Manual 3 channel (Standard 3 channel manual mode):

Ⅰ, Ⅱ, Ⅲ→aVR, aVL, aVF→V……

Switch to left lead button (button) is for switch to left lead in manual and rhythm modes during recording, and the lead switch sequence is contrary to the right switch sequence.

5.4 Copy of electrocardiogram waveform data

When the electrocardiogram recording is finished, the recorded waveform can be copied by pressing the button by users, and the instrument will copy the ECG data of the previous animal and display it onto the screen automatically. You can press the START/STOP button to trace the previous data, information about the animal and the analysis result. The following screen will be displayed:

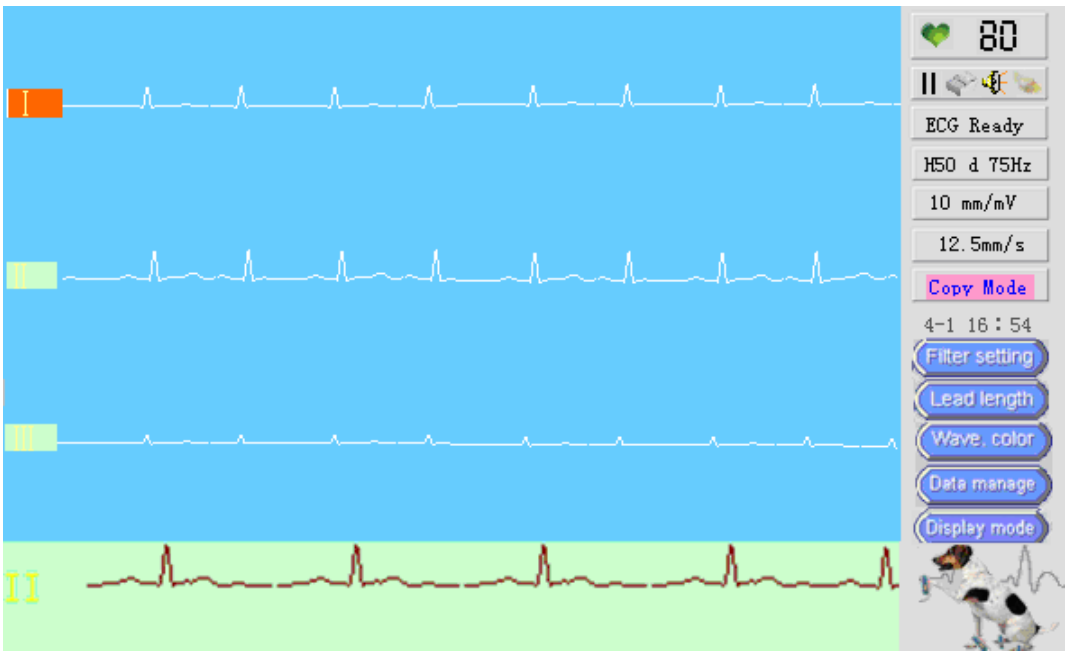


Figure 5-17 Copy of electrocardiogram waveform data

Note:

- **The electrocardiogram of the previous animal can be copied by pressing the COPY button only when （6/7）-lead ECG waveform and data is analyzed and recorded in the non-manual mode**
- **If the operation of instrument shutting down has been performed after the recording of previous animal, the COPY button will be invalid.**

5.5 Matters need attention during ECG waveform measurement and analysis:

(1) When the myoelectric or the power supply interference is relatively strong, the identification of P wave and Q wave is not always reliable. And the identification of ST section and T wave may not be reliable because of the baseline drift.

(2) Sometimes the ending position of S wave and T wave turns to be blended and unclear, and it might introduce the error to the measurement.

(3) When the detection of R wave is missed because of the Low voltage of QRS, there might be a large error in the heart rate measurement.

(4) The calculation of electrical axis of heart and the demarcation point identification for QRS wave is not always reliable because of the Low voltage of QRS.

(5) Frequent (repetitive) premature ventricular contraction might be detected as the representative beat occasionally.

(6) The P wave may be hard to be identified in presence of multi-arrhythmias thus the related parameters may not be reliable.

5.6 Explanation of the ECG Record Sample

Three lines of standard ECG waveforms

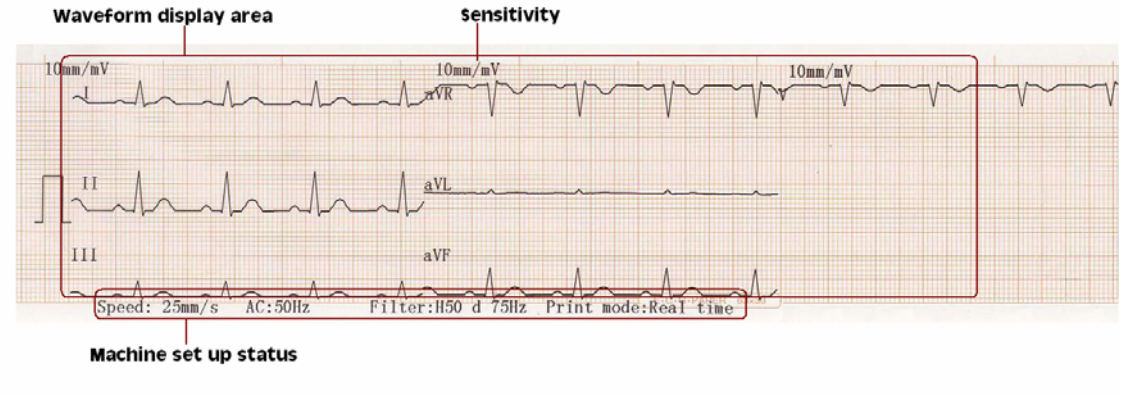


Figure 5-18 Three lines of standard ECG waveforms Sample

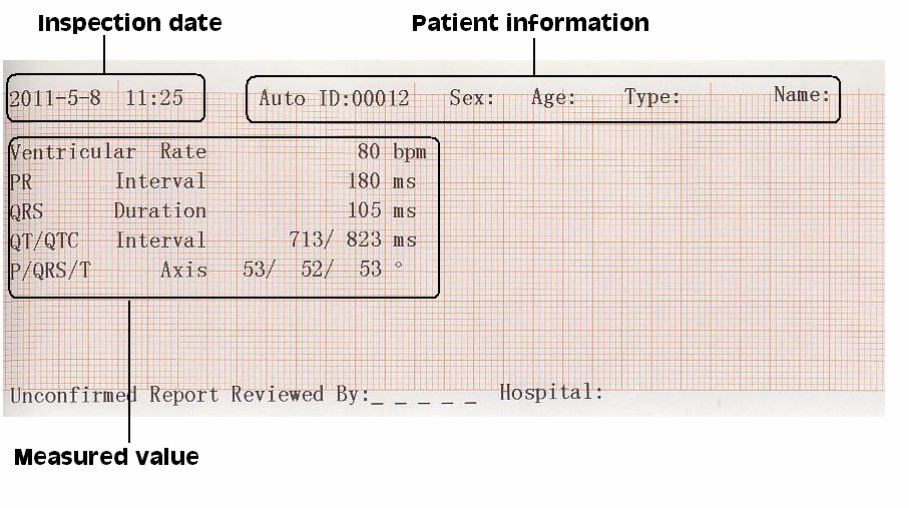


Figure 5-19 Three lines of standard ECG waveforms Sample

Chapter 6 System Parameters Setting

The system parameters of this instrument can be set in the menu. The displayed parameters in the menu are the factory default value, and the users can set the parameters which need to be changed before electrocardiogram recording.

6.1 Main menu

After starting the instrument , press the button to enter into the Menu setting interface, users can press button to move the Move the selection box to each option as shown below(Figure 6-1):

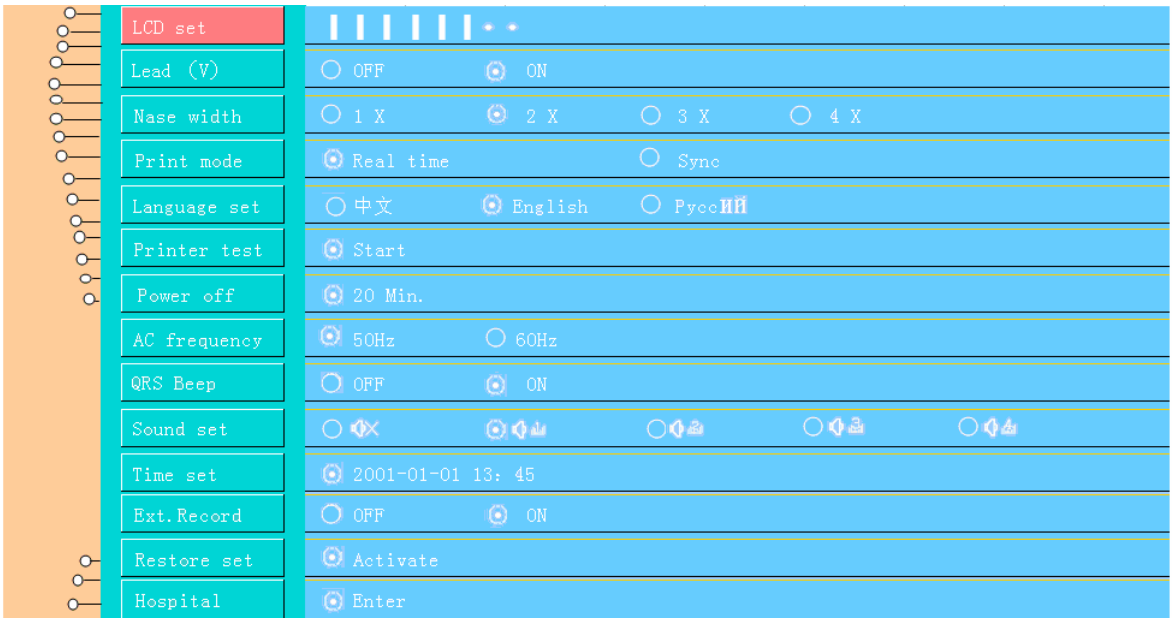


Figure 6-1 Main menu interface

In the Menu setting interface, the pink background is the current selected sub-menu, press button to enter the lower menu, press button to move the selection box for the other option.

Table 6-1 Parameters list of main menu

Parameters	Setting Value	Defaulting Value	Comment

LCD set			Adjust the LCD contrast
Lead (V)	OFF，ON	ON	Choose whether to open the V lead
Base width	1x、2x、3x、4x	2x	Select the width of the waveform baseline
Print mode	Real time，sync	Real time	Select data collection print mode
Language set	Chinese，English，русский	English	Setting the display language
Printer test	Start	Start	Print a test triangle
Power off	0 min 、5 min 、10 min….60min	20 min	Set Auto shutdown time
AC frequency	50Hz、60Hz	50Hz	Network Power Frequency Selection
QRS Beep	OFF，ON	OFF	Select Heart Rate Detection tone switch
Sound set			Select voice tone and switch
Time set	XXXX-XX-XX XX: XX	The current time	Year - month - day hour: minute format input
Ext. Record	OFF，ON	OFF	Select the external input signal record
Restore set	Activate	Activate	Restore the state of factory setting
Hospital	Enter	Enter	Input hospital name information

■ **LCD set**

Move the selection box to “LCD set”，press OK button and then press LEAD button ，users can adjust the LCD contrast..

■ **Print mode**

Real-time print mode is based on changes in the human body in real time as a ECG recording of printing method; The synchronization is the standard twelve lead ECG data is synchronized,

it means that each lead waveform situation at the same period of time . Data for each lead is the same starting time. Users can easily observe the data of each lead at the same time period.

Note:

Synchronous printing mode is only effective in the automatic mode.

- **Printer test**

Move the selection box to “Printer set”, Press OK button , then the instrument can print the triangle wave as shown below, Users can observe the triangular wave whether there is a breakpoint, bending or wave phenomena, and then test the print head is in good condition or not.

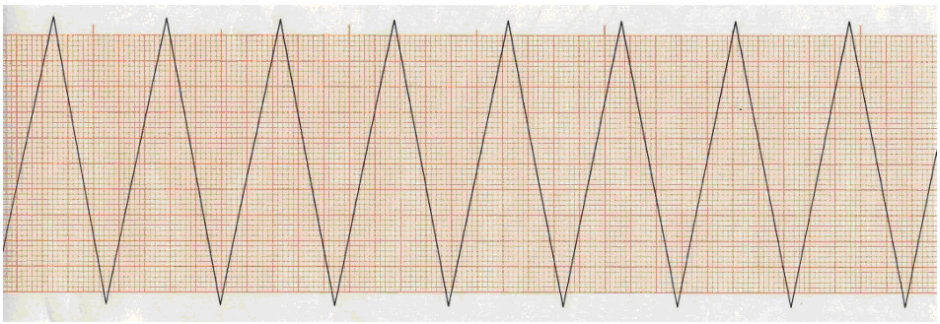


Figure 6-2 Printer testing mage of the information on the recorder

- **AC frequency**

This setting needs to match the frequency and use the AC, if you set it improper; it will affect the mapping results and analysis.

- **External Record**

External input is set as "On ", the machine enter into an external input screen, the screen display as shown below (Figure 6-3):

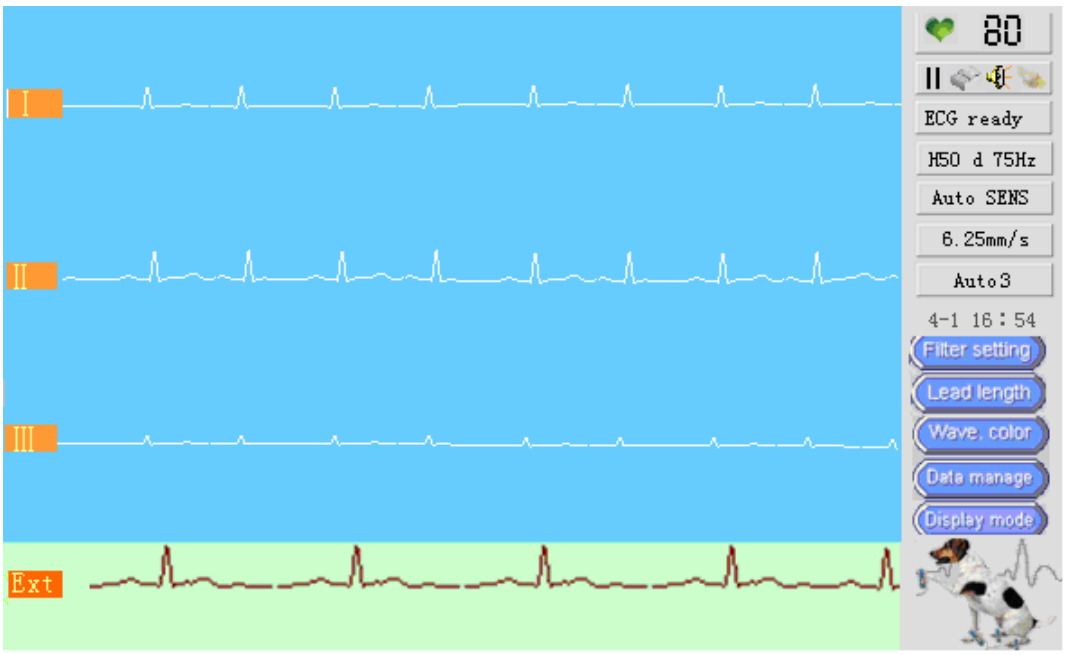


Figure 6-3 External Record status

Press START/STOP button（Start/Stop record button）to print the external input waveform.

■ **Hospital information**

Move the selection box to “Hospital”, press OK button to enter the hospital edit interface:

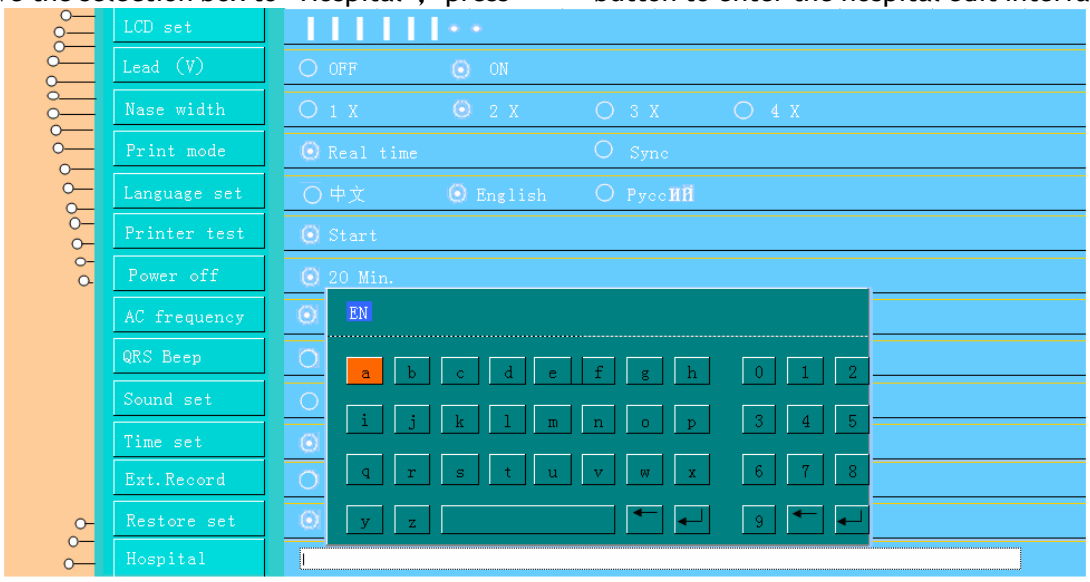


Figure 6-4 Hospital edit interface

Users can select the letters to input, detailed operation please see Chpter7 “Name inputting”.

6.2 Parameter setting

In the main interface, press the OK button, and then press MODE RESET button, users can move the selection box to set each parameter, as shown below(Figure 6-5):

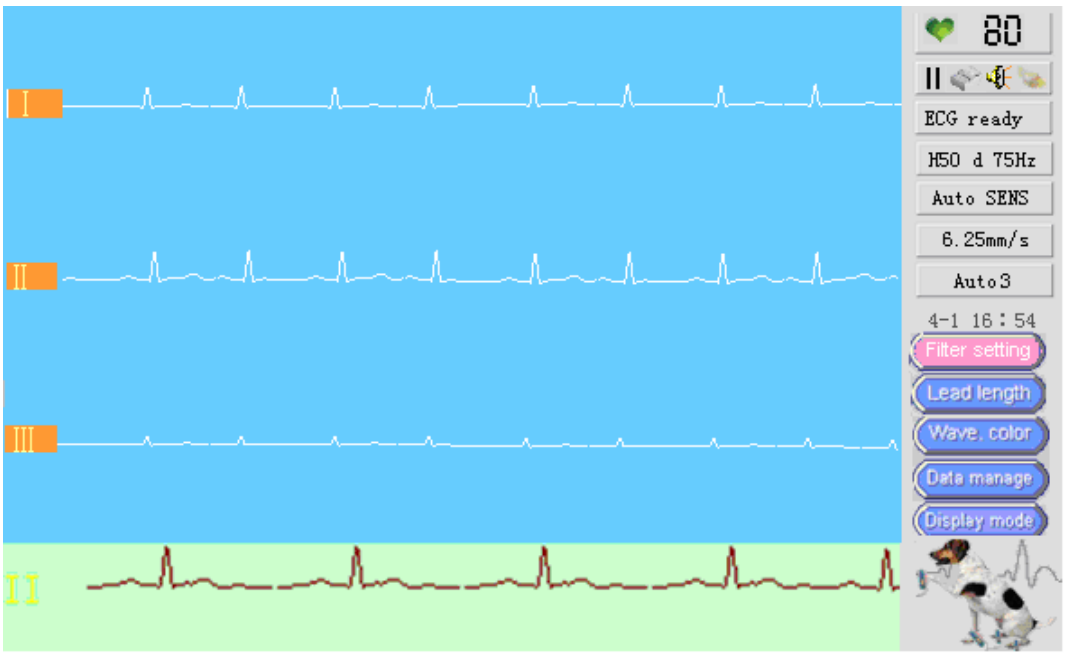


Figure 6-5 Parameter setting interface

Table 6-2 Parameter setting

Parameters	Setting Value	Defaulting Value	Comment
Filter setting	0.05Hz-150Hz, H50 d, H50 d 75Hz, H50 d 35Hz	H50 d 75Hz,	Filter setting
Lead length	3s—12s	3s	The length of a single channel recording time
Wave.color	White, black, red, green, blue, yellow, pink, blue, orange, purple	white	Select the display color of lead
Display mode	3, 6/7	3	Select the display mode of lead

Chapter 7 Animal Information and Data Administration

This chapter introduces how to input and display the animal information, as well as operation procedures of storing and transmitting of ECG data.

7.1 Animal Information Inputting

In the main interface, press 1mV/ID button, the animal information interface pops-up, after setting it, press button to return to the main interface (Figure 7-1).

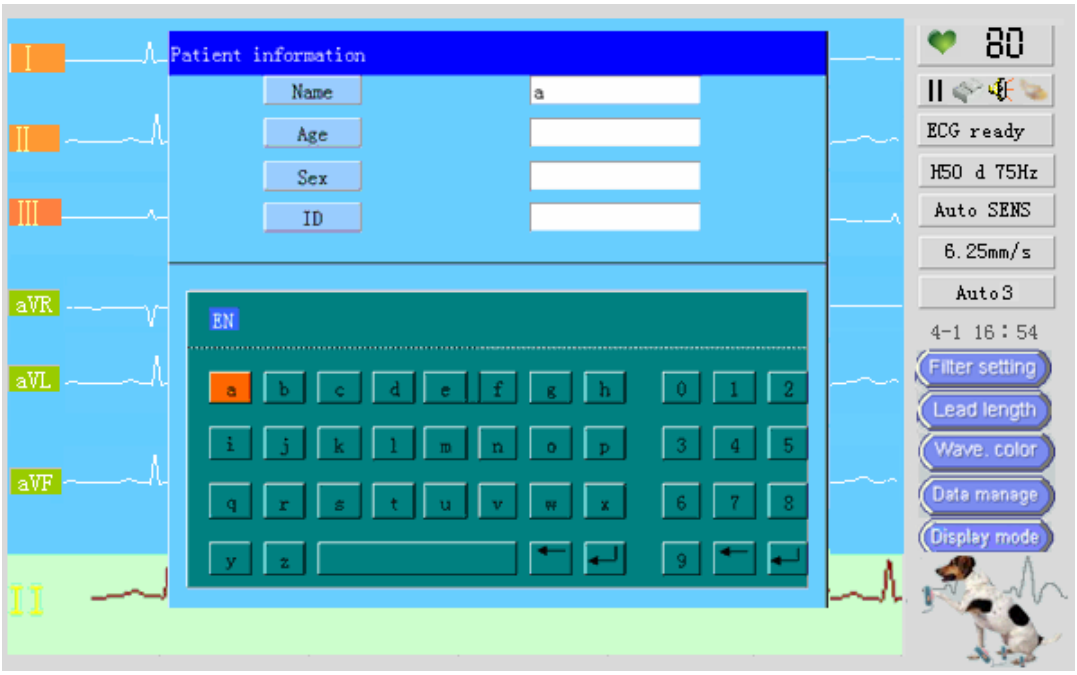


Figure 7-1 Animal information inputting interface

The screen displays the animal name, age, gender and ID number four setting items, and users can input the information according to the actual situation of the animal.

- **Name inputting**

Moving the selection box to select "Name", and then press the OK button or the ▲ MODE ▼ RESET button to move the selection box to the letters, and press the OK button to select, users can press the BACK button to exit.

- **Letters input**

Select the input mode "EN", in the letter keyboard enter the corresponding letter, and press the OK button to return to achieve the information inputting.

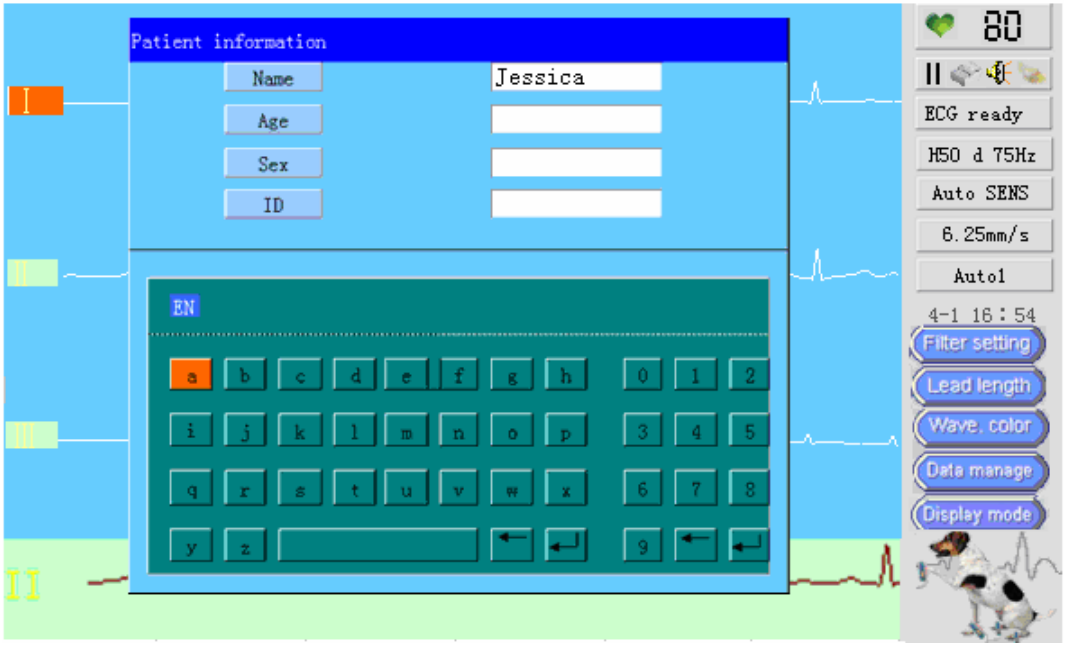


Figure 7-2 Letters input interface

- **Age inputting**

  when users is inputting the Age , the system will automatically to stay the selection box in the numeric keypad, in the numeric keypad, users can move the selection box to select the desired number of input, and then press OK button to input the information.

- **Sex selection**

  The default is "None", "None" means that in the report the gender column is blank, it is filled by the doctor, press the ◄ ► LEAD button to select "Male", "Female" or "None ", and then press BACK button to return.

- **ID**

  The machine automatically to give a unique ID number for collected ECG data ,and named the ID number to store ECG data; in this option, press the OK button, the instrument will prompt weather to clear ID(as shown below). Because the storing is

named by the ID number, if you choose "YES", it will result in duplication of storage, at last resulting in data management confusion.

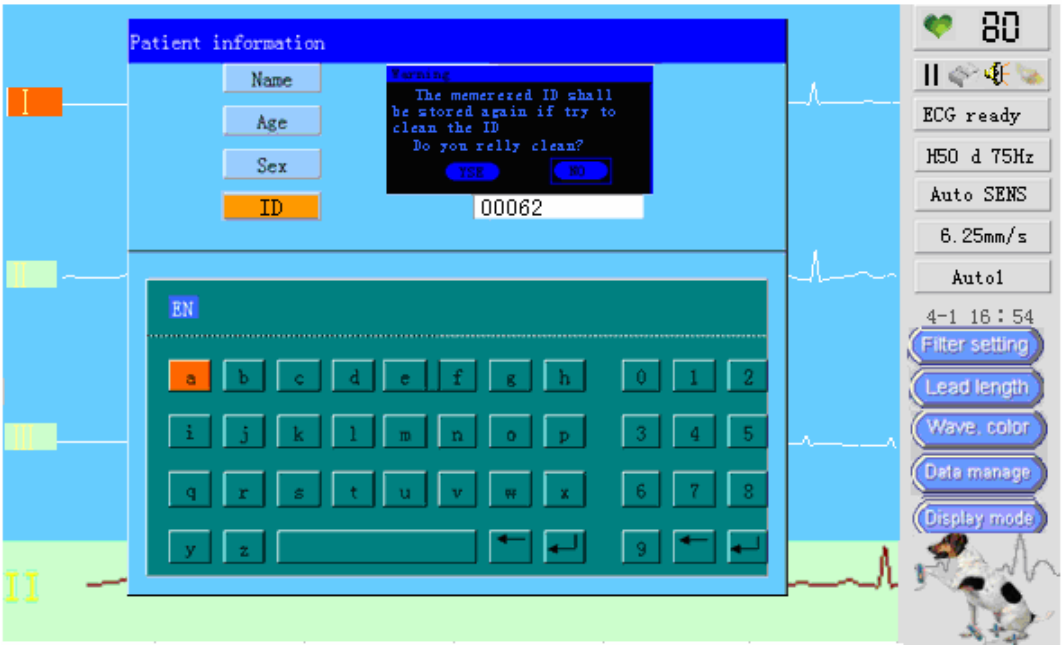


Figure 7-3 ID Input Warning

7.2 Data Manage

This instrument provides the storage medium internal memory for storing ECG ,Analysis and measurement recording ECG data can be stored in the storage medium.

In the main interface, press OK button ,then press ▲ MODE ▼ RESET button to move the selection box to “Data manage”, after selecting, press OK, the input interface will display as Figure 7-4: :

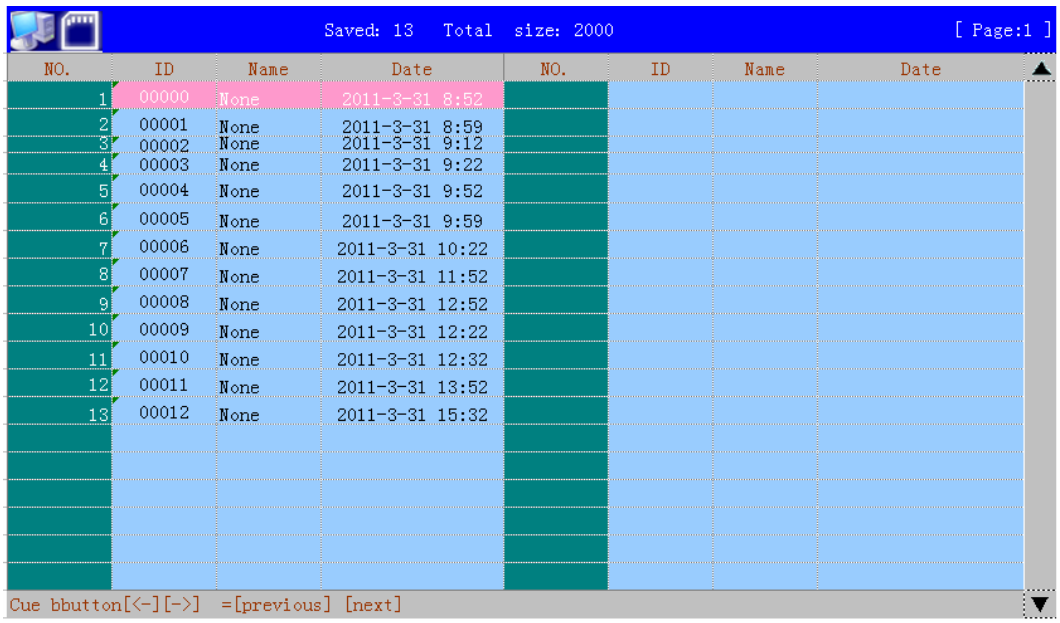


Figure 7-4 ECG data stored in the storage medium

When the instrument complete an ECG recording, ECG analysis results, and animal electrocardiogram data constitute a file saved in the default storage medium for Data query and management in the future.

- **Internal Memory**

The instrument's internal memory can store up to about 2,000 copies of ECG data (the actual situation according to the liquid crystal display). When the data storage is full, the new ECG data will automatically replace the first ECG data.

The current state of storage media is displaying on the screen, Store file and the animal's ID number in sequence to be storied, users can query and playback the waveform.

In the data storage screen, move the selection box to select the inspection ECG data, and then press the OK button to pop-up such dialog box as shown below (Figure 7-5):

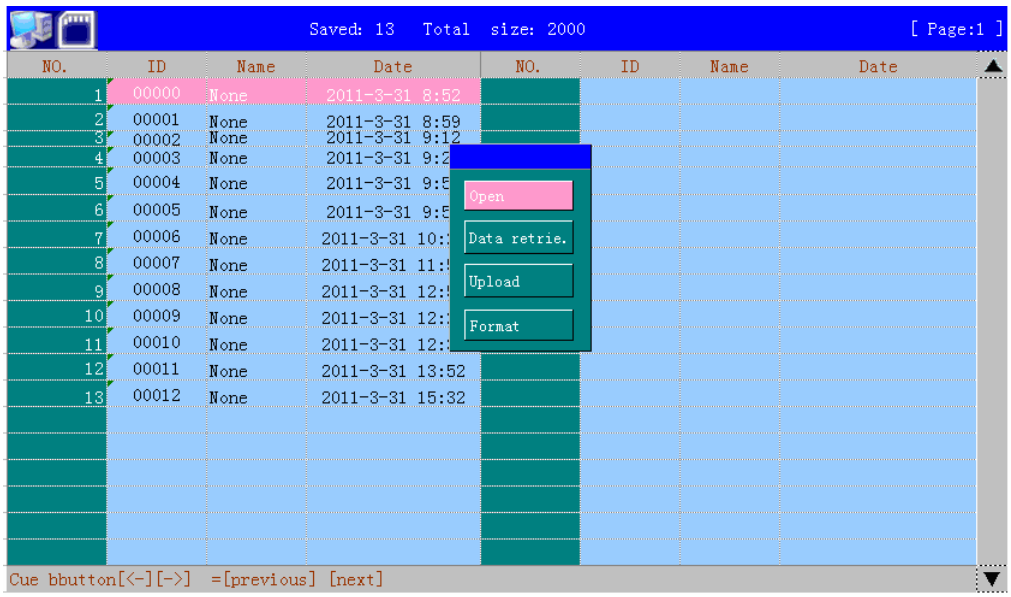


Figure 7-5 Data management operations

There are four options for user using: "open", "Data retrieval", "upload" and "Format", users can carry out the necessary processing and operations for ECG data.

■ Open file

Select "Open" option to playback the waveform and data access, LCD display the following "data playback" picture (Figure 7-6):

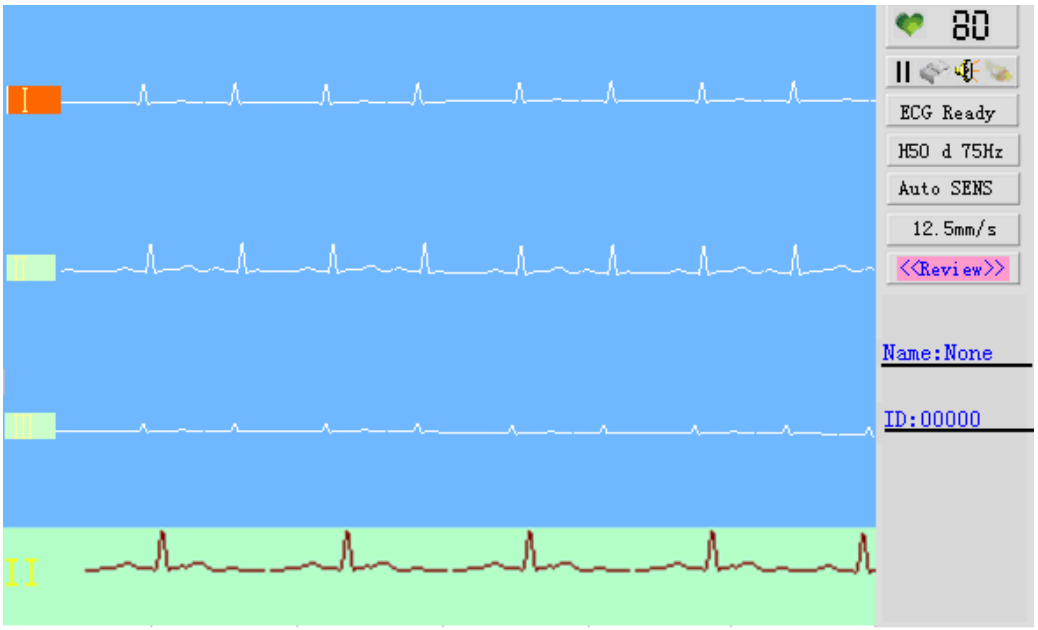


Figure 7-6 Data playback interface

This picture include 7-channel ECG waveform, the animal name, ID number , select the paper speed and press the START/STOP button to print this ECG data. Print ECG data in the "Wave Playback" mode, the instrument will automatically to print it as "Auto 3" mode, after printing the waveform, it will automatically to print the stored analysis results and the animal name, ID and time.

■ **Data retrieval**

Select ”Data retrieval” option, and press OK button:

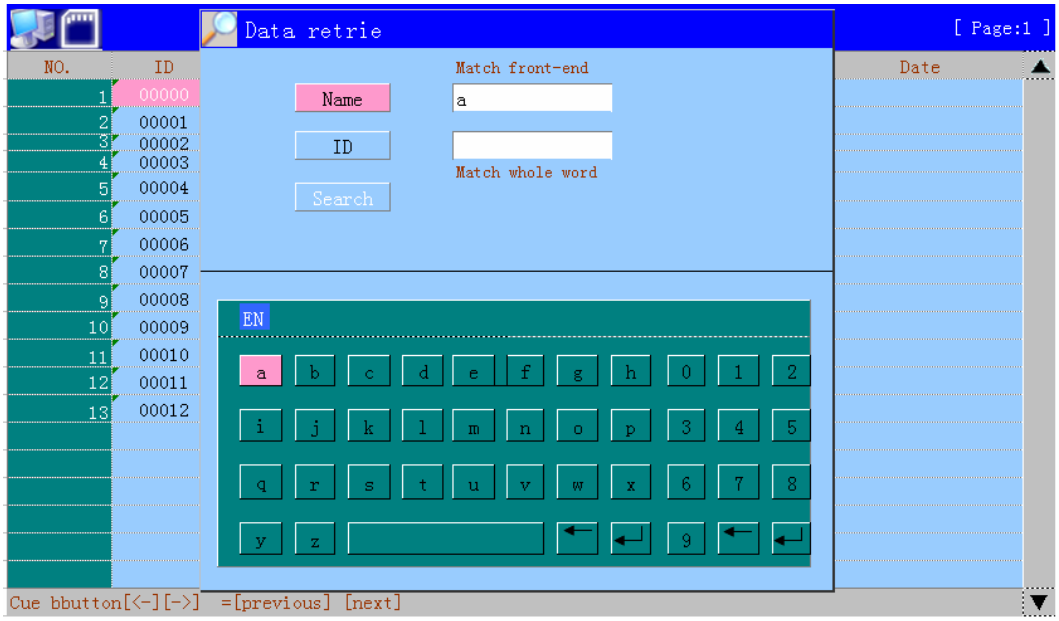


Figure 7-7 Data retrieval interface

There is "Name" and "ID" option in this dialog, in this dialog, users can retrieve the required ECG data.

■ **Upload file**

Select ”Upload” option, and press OK button:

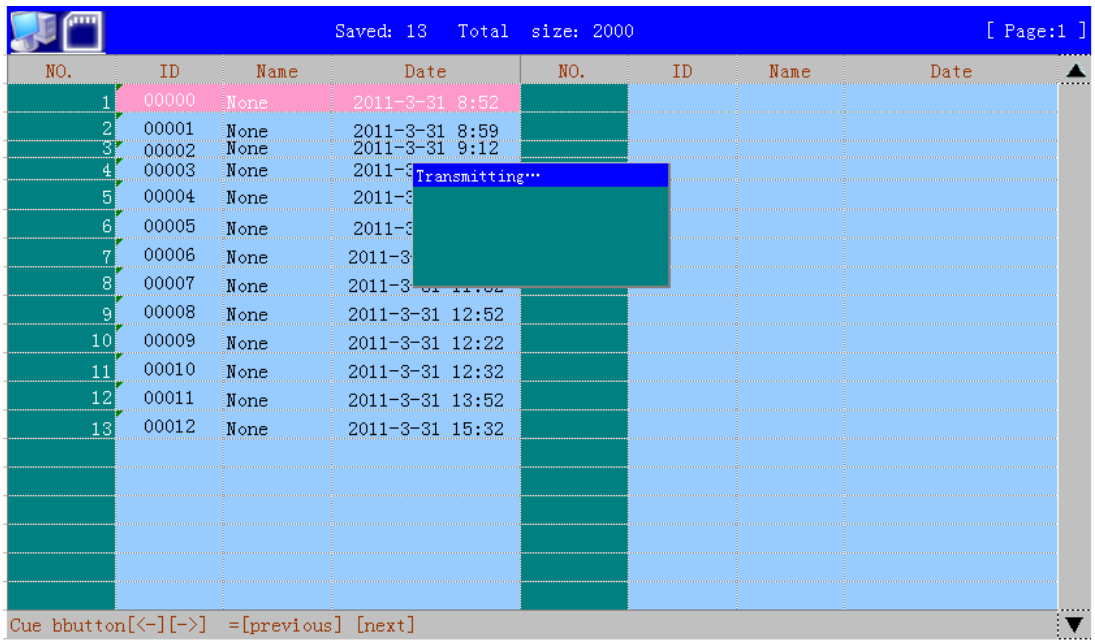


Figure 7-8 Upload file interface

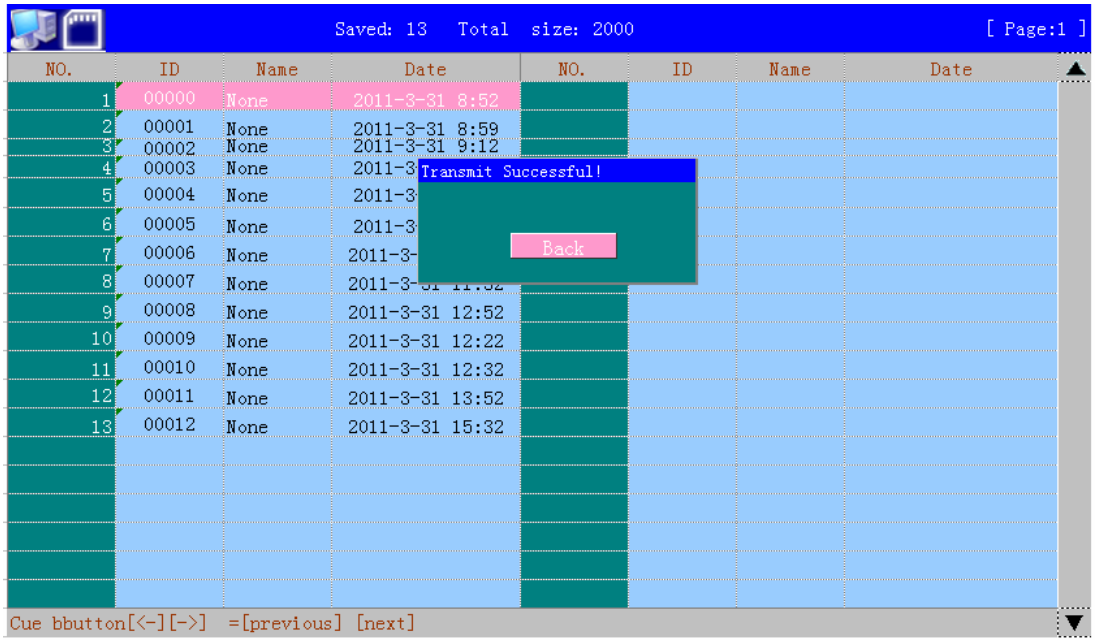


Figure 7-9 Upload file Successful interface

Note:

The data transfer function must be related to the user has the hardware, software support, Specifically refer to the instructions in this section," Management of Communication between the Product and Computer

■ **Format**

Select ”Format” option, and press OK button:

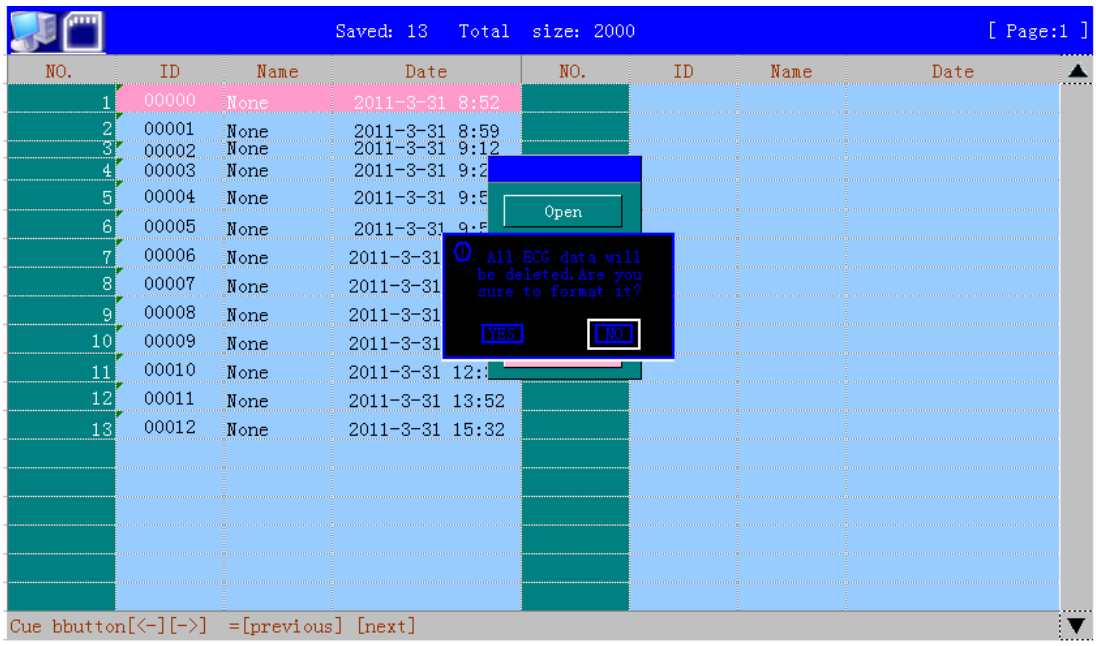


Figure 7-10 Warning of Format

The system prompts weather to format the memory, If format memory, the memory of all the corresponding records will be deleted, and can not be restored, please be sure!

7.3 Management of Communication between the Product and Computer

The product can conduct data transmission to computer through RS232 port. Before using this function, make sure that the product has beend reliably connected to the computer through

RS232 cable, and that the ECG management software designed by the computer has been installed in the computer. The connection between the product and the computer is as follows:

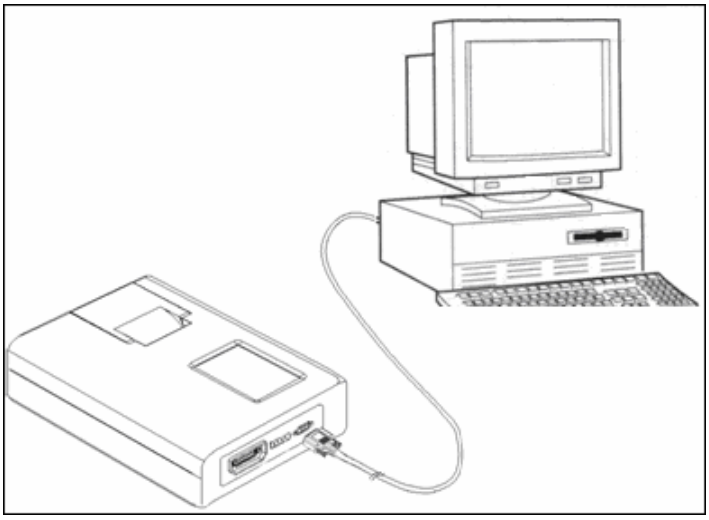


Figure 7-11 connection between the product and the computer

When the product is connected to the computer, select " Transmission" in the function menu of the product function and press OK button to realize data transmission.

Note:

1、RS232 connection cable should be the cable provided by the company along with the ECG management software or with the same specifications as it.

2、For detailed functions and operations of the ECG management software, please refer to the manual of ECG management software.

3、The ECG management software is an optional product, which can be purchases by contacting business personnel of the computer in case of need.

Chapter 8 Servicing and Maintenance

8.1 Matters needing attention about the repair and daily maintenance of the product

a. There is no part inside of the product that requires the user to conduct maintenance, the user's maintenance work normally involves the appearance cleaning of the product and checking of the effectiveness of controlling buttons and integrity of the outer insulating protection of the leads, thus the user should not dismantle the machine without approval;
b. When abnormal conditions of the product appear, mark the part with problem and conduct repair immediately, and do not use products with malfunctions. As there may be high voltage inside of the product that would be harmful to human, the repair of the product must be conducted by specialists with qualification, no other person shall open the body case of the product to conduct repair. The technical materials such as electrical schematic diagram and parts list that are needed for the repair of the product can only be provided to the repairing personnel with qualification;
c. Repair of product must be conducted according to the original design, and no model alteration is allowed. After repair, the product must go through necessary safety examination and measurements before it can be used;
d. The product and all its accessories must be maintained regularly, with a time interval no longer than half a year.
e. The product is the force measuring instruments, users should statutory qualifications to the local institutions to apply the measurement test, test period is not less than one year.

8.2 Maintenance and Replacement of the Built-in Battery

The built-in battery of the product is rechargeable battery which is installed inside of the product. As the service life of rechargeable battery is related to the times of charging and discharging, it is recommended to use AC power supply when the conditions permit to prolong the service life of the rechargeable battery. The electric capacity of the built-in rechargeable battery is displayed on the monitor of the product when using the battery to work, so the user can know whether the battery needs recharge through observing the electric capacity of the battery. When the battery is fully charged but the working time is less than 30 minutes, or the battery cannot be recharged,

the built-in battery may have lost its effectiveness and should be replaced. As the body case of the product should be dismantled to replace the built-in battery, the replacement of the built-in battery should be conducted by professional maintenance personnel, and the user should not replace it on itself in order to avoid electric shock. Meanwhile, the rechargeable battery with the same specifications must be used to replace the built-in battery to prevent accidents from happening. The detailed steps to charge the battery, display the electric capacity and protect the battery are explained as follows:

8.8.1 Recharging the Battery

There are battery charging and protecting circuits designed inside of the product. When the AC power cord is connected, the battery can be charged. When the product is not use for a long time, at least charge and discharge the battery every three months. When charging the battery, turn the product into standby status, and open the power switch at the back the product. During charging process, the charging indicator lamp on the front face of the product will blink, and when the charging is completed the indicator lamp will illuminate constantly.

8.8.2 Capacity Display of the Battery

When using battery to supply electricity, there would be a icon that represents the capacity of the battery in the monitor after the machine is turned on, as shown in the figure below. There are four shapes of the icon which indicate different capacities which are explained below:

 : Battery capacity is full;

 : Battery capacity is sufficient;

 : Battery capacity is not sufficient, needs recharge;

 : Battery capacity is empty, needs immediate recharge;

8.3 Recording paper

For ensuring the quality of the ECG waveform tracing, the high speed heat sensitive recording paper designated or provided by our company should be used. Using the undesignated recording paper may cause problems such as the service life of heat sensitive printing head falling , the unclear waveform recording and paper jam and should be given particular attention.

(1) Do not use the recording paper coated with wax , and the paper in the color of ray or black, or else the wax may adhere to heater of the printing head and lead to the printing head failure or damage.

(2) High temperature, moisture and sunlight will cause the color change of the recording paper, thus keep it in the dry and cool environment .

(3) Do not place the recording paper under the fluorescent light for long term or else the recording quality may be affected.
(4) Do not place the recording paper with the PVC plastic material or else it may cause the color change of the recording paper.
(5) When the recording paper is placed in cascade, the recorded waveform may be printed from one piece to another one each other.
(6) Particular attention should be given to the size of the recording paper. The recording paper of which size is not in compliance with the requirement may cause the damage of the heat sensitive printing head or the silicon rubber roll.

8.4 Instrument maintenance after using

The following maters should be given particular attention after using the ECG instrument:
(1) Press the ON/OFF button on the control panel to set the instrument in the stand-by status.
(2) Hold the plug to pull off the power supply cable and the lead lines instead of holding the cable.
(3) Clean up the instrument and accessories, then place the dust cover on it.
(4) Keep the instrument in the dry and cool environment. Prevent it from intense shock when moving it.
(5) Do not soak this instrument into the detergent when cleaning it. Please cut off the power supply first when cleaning the outer shell of the instrument . Please clean the instrument with the neutral detergent instead of using the detergent containing alcohol or using the sterilizer.

8.5 Inspection and maintenance of lead lines and electrodes

1 The continuity condition can be tested by the multimeter. Please inspect the contacting condition of each lead line based on the following table . The electric resistance between the electrode end and the lead plug pin for each lead line should be less than 10Ω. Please inspect the continuity condition of the lead lines regularly, since the damage of any one line among them will cause the false waveform of corresponding lead or the entire lead in the electrocardiogram. The lead lines can be cleaned with the water and soap as well as sterilized with 75% alcohol (do not soak the lead lines into the liquid for sterilization).

Note: The electric resistance of the lead line with the protective function of anti-defibrillation is 10kΩ approximately.

Table 8-1 Symbol for connector plug and Position for plug and pin

Symbol for connector plug	R	L	F	RF	C					
Position for plug and pin	9	10	11	14	12	1	2	3	4	5

2. Bending the lead line in the sharp angle or knotting will decrease the service life of the lead line, thus please perform the electrodes connection after tidying the lead line as possible .
3. The electrodes should be stored well. After using for long term, the oxidation color change of the electrodes may occur due to corrosion and so on , and the electrocardiogram may be affected. If this happens, please replace the electrodes in time.

8.6 Maintenance of silicon rubber roll

The silicon rubber roll should be kept in a stable, smooth and clean condition , or else the quality of the ECG recording may be affected . To clean off the stain on the silicon rubber roll, please wipe it along the long axis by a clean soft muslin with a little alcohol, while turning the silicon rubber roll along the transmission direction of recording paper to clean it entirely.

8.7 Cleaning of the heat sensitive printing head

The definition of the recorded waveform will be affected by the stain and dust on the surface of heat sensitive printing head. To clean the surface of the printing head , you can open the paper compartment cover after shutting down the instrument , then wipe the surface of printing head gently by the clean and soft muslin with a little alcohol . The residual contaminant on the printing head should be wetted with a little alcohol before removing with the soft muslin. Do not scrap the surface of printing head with the hard article or else the printing head will be damaged. Do not close the paper compartment cover before the alcohol is evaporated entirely .The printing head should be cleaned once per month when normally used.

8.8 Fuse replacement

If the AC power indicator light does not light when the AC power cable is connected and the power switch at the back of the instrument is on , as well as the instrument is unable to be started by pressing the ON button on the control panel or the battery status symbol as  is displayed after starting the instrument. If the AC power supply at the socket is confirmed to be in a normal

condition, it is probable that the fuse has blown. At this time the AC power supply fuse should be replaced . The fuse is located in the internal portion of the instrument and should be replaced by the professional or the manufacturer.

a. Cut off the AC power supply of the product;
b. Turn the product up side down and insert a screwdriver into the tube fuse seat at the bottom of the product and turn the screwdriver until it is separate from the product;
c. Take out the tube fuse in the tube fuse seat to check whether the fuse is melted down, if so, replace a tube fuse with the same specifications, otherwise check the other tube fuse;
d. Install the new tube fuse into the fuse cap and align it to the position of the original tube fuse seat and use a screwdriver to fasten it clockwise;
e. If the two tube fuses are not damaged after inspection, but the product cannot work with AC power supply, then the internal circuit may have malfunction, and the product should be sent to repairing organization with qualification to be repaired;
f. When a new tube fuse is replaced and it is melted down when connecting power supply, then there may be other potential troubles in the internal circuit of the product, and the product should be sent to repairing organization with qualification to be repaired.

Chapter 9. Common Malfunctions and Eliminating Methods

9.1 Phenomenon of malfunction: waveforms of some leads cannot be detected during waveform recording.

Solution: There are several reasons for this phenomenon as follows:

1）When the product is connected to the animal, the internal baseline stabilization system needs time to adjust, just wait for a while.

2）When the phenomenon occurs when all the leads are in good status of contact, just press the lead closing button to quickly stabilize the waveforms of the channels.

3）There may be breakage of the leads, check the leads.

4）When the above reasons do not exist and this phenomenon still occurs, there may be malfunction in the signal channel of the product, please contact the after-sales personnel of the company or designated maintenance organization.

9.2 Phenomenon of malfunction: the waveform information printed has breaking points in the vertical direction

Solution: normally it is because the surface of printing head is contaminated with dusts or dirt, and it can be solved by cleaning the printing head after turning off the machine. If the phenomenon still exist when the printing head is cleaned, then part of the heating units may be damaged and need replacement. Please contact the after-sales personnel of the company or designated maintenance organization to replace the printing head.

9.3 Phenomenon of malfunction: some buttons or all the buttons on the control panel malfunction

Solution: its reason normally is that connecting parts of the control panel and the internal circuits of the product may be loose or the control panel may be damaged. In this event, ask professional maintenance personnel to open the upper cover of the product and reconnect the connection parts of the control panel and internal circuit of the product, or replace the control panel.

9.4 Phenomenon of malfunction: during recording process of the ECG, there are disturbance of certain amplitude and order in the waveform, and there are obvious shakes of the baseline (namely the AC interference) as shown in the figure below:

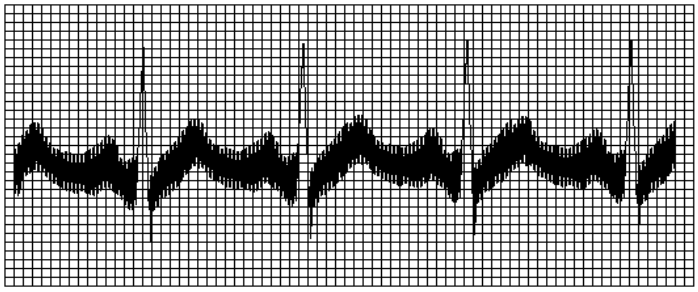


Figure 9-1 AC interference information on the recorder paper

Solution: it may be cause by the following reasons. Please check and eliminate the causes in sequence:

1）Whether the product is properly grounded?

2）Whether the connection of electrodes and leads are correct?

3）Whether conductive grease is smeared at the parts of skin that contact the electrodes?

4）Whether the metal animal bed is properly grounded?

5）Whether the animal contacts the wall or the metal parts of the animal bed?

6）Whether there is any one who contacts the animal?

7）Whether there is any electrical equipment with high power working? (Such as X-ray set or ultrasonic products).

When the above causes are checked in sequence and no problem has been found and the disturbance cannot be eliminated still, please set the AC interference filter to current status in the product menu to effectively restrain the disturbance.

9.5 Phenomenon of malfunction: the baseline shakes abnormally on the ECG waveform (namely the muscle electricity disturbance) as shown in the figure below:

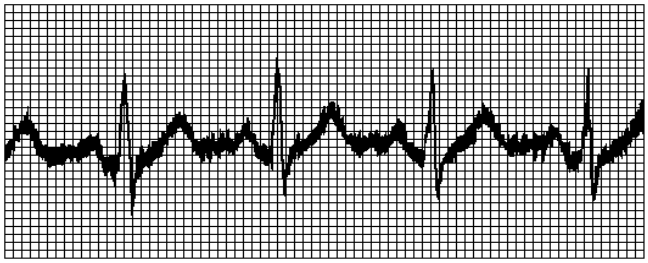


Figure 9-2 Myoelectric interference information on the recorder paper

Solution: the cause to this phenomenon is mainly the over nervousness of the animal. Please check and eliminate the following causes in sequence:

1）Whether the environment and ambient temperature are convenient?

2）Whether the animal is overly nervous by the narrowness of bed?

3) Whether the animal feels inconvenient by the tightness of the electrode clamps on the limbs?

When corresponding measures are taken to solve the above causes and the disturbance still exists, please set the muscle electricity disturbance filter to the current status on the product menu to effectively restrain the disturbance. However, after conducting the above measure, the ECG

waveform recorded will be attenuated a little, especially for the R wave, so the doctor should pay attention to that.

9.6 Phenomenon of malfunction: the baseline of ECG waveform moves up or down irregularly (namely the baseline is unstable) as shown in the figure below.

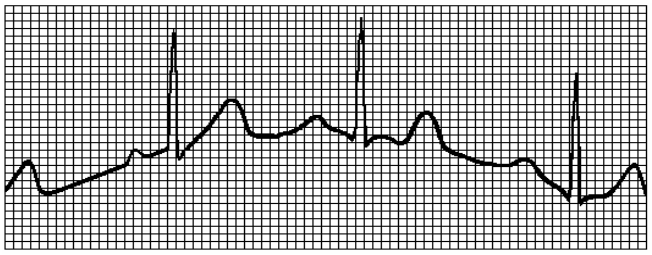


Figure 9-3 Instability of baseline interference information on the recorder paper

Solution: The reason to this phenomenon is the instability of signals acquired. Please check and eliminate the following causes in sequence:

1）Whether the installation of electrodes is stable?

2）Whether the connection of the leads and electrodes are reliable?

3）Whether parts of the animal's skin that contact the electrodes are clean?

4）Whether limbs of the animal move or the breath of the animal is uneven during recording process?

5）Whether the old and new electrodes are use together during recording process?

When corresponding measures are taken to solve the above causes and the disturbance still exists, please set the baseline drift filter to the current status on the product menu to effectively restrain the disturbance

Appendix A Technical Specification

1) Main unit

Table A-1 Main unit specification

Lead	Standard 7-lead	
Acquisition mode	Simultaneous 12-lead acquisition	
Input mode	Floating input, have defibrillation protection effect and pacing pulse suppression	
Recording format	Automatic 1 channel, Automatic 2 channel, Automatic 3 channel, Manual 1 channel, Manual 2 channel, Manual 3 channel	
Recording mode	Automatic	Record in appropriate format and automatic lead switch with measurement and analysis function
	Manual	Record in appropriate format and manual lead switch without measurement or analysis function.
Measurement parameters:	Ventricular rate, PR interval, QRS time limit, QT/QTC interval, P/QRS/T axis, RV5/SV1 amplitude and RV5+SV1 amplitude	
Input CIR current	≤0.1μA	
Input impedance	>50MΩ	
Animal leak current	<10μA	
Time constant	≥3.2s	
Frequency response	0.05Hz—150Hz	
Sensitivity threshold	≤20μV（10Hz）	
Noise level	≤15μV_{p-p}	
Standard Sensitivity	10mm/mV	
Scaling Voltage	1mV	
Polarization resistance Voltage	±500mV	
External input (EXT)	Single-ended input	
	Input impedance	≥100kΩ
	Sensitivity:	10mm/V
External output (CRO)	Single-ended output	
	Output impedance	≤100Ω
	Sensitivity	1V/mV
Filter	AC: 50Hz, ≥20dB EMG: 35Hz or 75Hz（-3dB）	
Sensitivity	2.5mm/mV, 5mm/mV, 10mm/mV, 20mm/mV	
Record speed	6.25mm/s, 12.5mm/s, 25mm/s, 50mm/s	

2) Recorder

Table A-2 Recorder Specification

Record mode	Thermal Dot Matrix Word Printing System
Resolution	≥8dots/mm （Vertical） ≥16dots/mm （25mm/s）; ≥8dots/mm （50mm/s）（Horizontal）
Paper speed	6.25mm/s,12.5mm/s,25mm/s,50mm/s
Recording Paper Specifications	Width of 63mm rolls

3） LCD

Table A-3 LCD specification

Display on LCD	The whole instrument work status, time, heart rate, and with the backlight

4) Others

Table A-4 Others specification

Lead lines	Standard 4/5-lead wire protection without defibrillation
Safety Classification	IEC60601-1：2005 Class Ⅰ Type CF
power supply	AC：100V—240V,50Hz,40VA
	DC：12V/1800mAh, Ni-MH battery
Fuse specification	2-Φ5×20mm AC latency fuse T800mA/250V

Appendix B Other Product specifications and environmental requirements

B.1 Dimensions and weight

Table B-1 Dimensions and Weight

Length × width × height	360mm×325mm×86mm
Packing size	400mm×300mm×200mm
Net weight	3.0kg
Gross weight	4.3kg

B.2 Environment requirements

Table B-2 Environment Requirements

1	Transportation	
	Environment temperature	-20℃—+55℃
	Relative humidity	25%—95% (No condensation)
	Air pressure	500ha—1060hPa
	In accordance with the requirements stipulated in the contract order, the transport process to prevent rain and sun.	
2	Storage	
	Environment temperature	-10℃—+40℃
	Relative humidity:	25%—80%
	Air pressure	500hPa—1060hPa
	The packaging of ECG stored in the non-corrosive gases and well-ventilated room.	
3	Using	
	Environment temperature	+5℃—+40℃
	Relative humidity:	25%—95%
	Air pressure	700hPa—1060hPa

Appendix C Package and Accessories

C.1 Accessories Along with the Machine

The standard configuration of the product normally contains the following accessories and documents in the following table with the quantities indicated below. When there are additional accessories contained in the user's order or contract, they will be listed in the product packing list, and the content of the table below will not be adjusted, so please check and accept the delivery according to the items in the product packing list.

Table C-1 Accessories with the Product

Electrocardiograph Main Unit	1 unit
ECG Cable	1 piece
Limb Electrode	4 pieces/sets
Power Cable	1 piece
Grounding Cable	1 piece
Paper Shaft	1 piece
Dustproof Cover	1 piece
Thermal Recording Paper	1 copy
Packing List	1 copy
Qualified Certificate	1 copy
User's Manual	1 copy

C.2 Matters Needing Attention

1) When opening the casing, check the integrity of packing case fist, and refuse to accept the product when the appearance of the packing case is damaged. When opening the packing case, please start with the top side of it;
2) After the case is opened, the user should check the accessories and documents according to the product packing list, and contact the business personnel of the company in case of unconformity;
3) Do not electrify the machine to conduct test run when the body case of the product is damage, and contact business personnel of the product immediately for treatment in that case;
4) Do not use accessories other than the originally provided accessories of the product, otherwise the performance and safety of the product may be affected;
5) The packing case must be properly kept for use in case of transportation for maintenance.

Appendix D EMC- Guidance and manufacture's declaration

D.1 Guidance and manufacture's declaration-electromagnetic emissions for all EQUIPMENT and SYSTEMS

Guidance and manufacture's declaration-electromagnetic emissions		
The ECG-300G is intended for use in the electromagnetic environment specified below. The customer of the user of the ECG-300G should assure that it is used in such an environment		
Emission test	**Compliance**	**Electromagnetic environment-guidance**
RF emissions CISPR11	Group1	The ECG-300G uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF emission CISPR11	Class B	
Harmonic emissions IEC 61000-3-2	Class A	
Voltage fluctuations/ flicker emissions IEC 61000-3-3	Complies	

D.2 Guidance and manufacture's declaration-electromagnetic immunity for all EQUIPMENT and SYSTEMS

Guidance and manufacture's declaration-electromagnetic immunity			
The ECG-300G is intended for use in the electromagnetic environment specified below. The customer of the user of the ECG-300G should assure that it is used in such an environment			
Immunity test	**IEC60601 test level**	**Compliance level**	**Electromagnetic environment guidance**
Electrostatic discharge(ESD) IEC61000-4-2	±6KV contact ±8KV air	±6KV contact ±8KV air	Floors should be wood, concrete or ceramic tile. If floor are covered with synthetic material, the relative humidity should be at least 30%. If ESD interface with the operation of equipment, counter measurements such as wrist strap, grounding shall be considered.
Electrical fast transient/burst IEC61000-4-4	±2KV for power supply lines ±1KV for input/output lines	±1KV for power supply lines ±1KV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC61000-4-5	±1KV differential mode ±2KV common mode	±1KV differential mode ±2KV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variation power supply input lines IEC61000-4-11	<5% U_T (>95% dip in U_T) for 0.5 cycle 40% U_T (60% dip in U_T) for 5 cycle 70% U_T (30% dip in U_T) for 25 cycles <5% U_T (>95% dip in U_T) for 5 sec	<5% U_T for 0.5 cycle 40% U_T for 5 cycle 70% U_T for 25 cycles <5% U_T for 5 sec	Main power quality should be that of a typical commercial or hospital environment. If the user of the ECG-300G requires Continued operation during power mains interruptions, it is recommended that the ECG-300G be powered from an uninterruptible power supply or a battery.
Power frequency (50Hz)magnetic field IEC61000-4-8	3A/m	3A/m	Mains power quality should be that of a typical commercial or hospital environment.
NOTE U_T is the A.C mains voltage prior to application of the test level			

D.3 Guidance and manufacture's declaration-electromagnetic immunity for EQUIPMENT and SYSTEMS that are not LIFE-SUPPORTING

Guidance and manufacture's declaration-electromagnetic immunity

The ECG-300G is intended for use in the electromagnetic environment specified below. The customer of the user of the ECG-300G should assure that it is used in such an environment

Immunity test	**IEC60601 test level**	**Compliance level**	**Electromagnetic environment-guidance**
Conducted RF IEC61000-4-6 Radiated RF IEC61000-4-3	$3V_{ms}$ 150KHz to 80MHz 3V/m 80MHz to 2.5GHz	3V 3V/m	Portable and mobile RF communications equipment should be used no closer to any part of the ECG-300G, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter. Recommended separation distance $d= 1.2\sqrt{P}$ $d= 1.2\sqrt{P}$ 80MHz to 800MHz $d= 2.3\sqrt{P}$ 800MHz to 2.5GHz Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in metres (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, range [a] should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of Equipment marked with the following symbol: 

NOTE1：At 80MHz and 800MHz, the higher frequency range applies.

NOTE2：These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and animal.

A. Field strengths from fixed transmitters, such as base stations for radio(cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the
location in which the ECG-300G should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the ECG-300G.

B. Over the frequency range 150kHz to 80 MHz, field strengths should be less than 3V/m.

D.4 Recommended separation distance between portable and mobile RF communications equipment and the EQUIPMENT or SYSTEM for EQUIPMENT or SYSTEM that are not LIFE-SUPPORTING

Recommended separation distance between portable and mobile RF communications equipment and the ECG-300G

The ECG-300G is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of the ECG-300G can help prevent electromagnetic Interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the ECG-300G as recommended below. According to the maximum output power of the communications equipment.

Rated maximum output power of transmitter (W)	**Separation distance according to frequency of transmitter(m)**		
	150kHz to 80MHz $d=1.16\sqrt{P}$	**80MHz to 800MHz** $d=1.16\sqrt{P}$	**800MHz to 2.5GHz** $d=2.33\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0. 38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer.

NOTE1 At 80MHz and 800MHz,the higher frequency range applies.

NOTE2 These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and animal.